Mathematics Grade 4

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Online:
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C O N N E X I O N S

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Collection structure revised: September 18, 2009
PDF generated: February 6, 2011
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Table of Contents

1 Term 1

- **1.1** Counting . . . 1
- **1.2** The place value of digits in whole numbers . . . 9
- **1.3** Written and mental calculations with whole numbers . . . 22
- **1.4** Financial problems and drawing up a budget . . . 31
- **1.5** Ways of counting in local languages and different cultures . . . 38

2 Term 2

- **2.1** Numeric patterns . . . 47
- **2.2** Common fractions with different denominators and numerators . . . 64
- **2.3** Comparing fractions . . . 82
- **2.4** Recognise and represent decimal fractions . . . 90

3 Term 3

- **3.1** Learn to read, tell the time and write the time from analogue clocks . . . 101
- **3.2** Visualise and name 3-dimensional objects in the environment . . . 119
- **3.3** Decimal fractions in the context of measurement . . . 138

4 Term 4

- **4.1** Investigate and compare 2-dimensional shapes . . . 147
- **4.2** Investigate and approximate the area of polygons . . . 161
- **4.3** Three-dimensional objects from the environment . . . 176

Attributions . . . 186

Chapter 1

Term 1

1.1 Counting[1]

1.1.1 MATHEMATICS

1.1.2 Grade 4

1.1.3 WHOLE NUMBERS AND THEIR RELATIONSHIPS

1.1.4 Module 1

1.1.5 COUNTING

ACTIVITIES:

- Count forwards and backwards in 2s; 3s; 5s; 10s; 25s; 50s and 100s

from 0 to 10 000 [LO 1.1]

- Begin to use a calculator [LO 1.10]
- Begin to perform mental calculations involving addition and subtraction [LO 1.9]
- Begin to solve problems in context [LO 1.6]

NUMBERS, OPERATIONS AND RELATIONSHIPS

- Numbers are wonderful. We need them every day in our lives. Welcome to the wonderful world of numbers, figures and symbols. We hope to travel with you on the journey of exploration in the world of numbers, so let's start.

1. **COUNTING IN THE EVERYDAY WORLD**

- In the Foundation Phase you learnt to count to at least 1 000. See how well you can complete the following exercise:
- Each day airlines need to work with many numbers. Imagine you are a member of a ground crew and you are counting paper coffee mugs for the passengers on an aircraft.

1.1 You are counting them in 2s and have reached 592. Write down the next five numbers:
1.2 Now you decide it is quicker to count them in 5s. You reach 980. Write down the next five numbers:

[1] This content is available online at <http://cnx.org/content/m30492/1.1/>.

1.3 You are still counting paper cups for the aircraft but now you decide to count them in tens. You have reached 660. Write down the next five numbers:

1.4 Now you are in a hurry! You count them in 25s. You reach 725. Write down the next five numbers:

1.5 You have enough paper cups for a month! Count them in 50s from 800 to one thousand and fifty and write down these numbers:

1.6 The plane is about to take off! Now you are really in a hurry! Count them in hundreds from 0 to 1 100 and write down the last five numbers:

1.7 The distance from Cape Town to Johannesburg is one thousand, four hundred and two kilometres. Write this distance in numbers:

2. **MAKING YOUR CALCULATOR COUNT**

- Now we know you can count to 1 000. Can you make your calculator count in 2s *without* pressing `[U+F02B]` 2 each time?

HOW TO MAKE YOUR CALCULATOR COUNT:

2.1 Clear your calculator.

Press 2 `[U+F02B]` = = = =

Some calculators need the command: 2 `[U+F02B]` `[U+F02B]` = = = = or

2 `[U+F02B]` K = = = =

Get to know your calculator.

2.2 Make your calculator start at 1 004 and count on in 2s

Clear your calculator. Now press 1 004 + 2 = = = =

Some calculators need: 2 + + 1 004 = = = =

2.3 How will you make your calculator "count backwards"?

Clear your calculator. Begin with 7 190 and count backwards in 2s.

Some calculators need: 2 - - 7 910

Always remember to clear your calculator before you begin. Now you are ready to begin the "Group Work".

You should do the next few exercises for five minutes each day for the rest of the first term at least, until you find them really easy. Numbers may be changed.

3. **COUNTING FORWARDS AND BACKWARDS (Oral group work):**

Now that you have learnt how to make *your calculator* count backwards and forwards in intervals, check that *you* can still do so too, aloud. You may work in groups. Only one learner in each group will be using a calculator. Your educator will explain how to play this game, so listen carefully.

3.1 Count on in 2's from 186 to 204. Count backwards in 2s from 208 to 194.

3.2 Count on in 3's from 0 to 36. Count backwards in 3s from 36 to 0.

3.3 Count on in 5's from 375 to 425. Count backwards in 5s from 545 to 485.

3.4 Count on in 10's from 950 to 1 020. Count backwards in 10s from 950 to 840.

3.5 Count on in 25's from 625 to 1 000. Count backwards in 25s from 975 to 675.

3.6 Count on in 50's from 550 to 1 050. Count backwards in 50s from 750 to 350.

3.7 Count in hundreds from 400 to 1 100. Count backwards in 100s from 1 000 to 0.

4. **COUNTING FORWARDS AND BACKWARDS (Individually):**

- Now your educator may ask you to count individually. See if you can count forwards and backwards on your own. Your educator may ask you to start with larger numbers. Maybe you would like to practise this with a friend first. Use your calculator to experiment with, and start with larger numbers.

5. **COUNTING WITH LARGER NUMBERS (Oral individual work):**

- Remember to use your calculator as an investigative (learning) tool if necessary:

5.1 Count on in 2s from 9 980 to 10 000. Count backwards in 2s from 5 010 to 4 990.
5.2 Count on in 3s from 8 982 to 9 000. Count backwards in 3s from 1 836 to 1 800.
5.3 Count on in 5s from 4 870 to 5 015. Count backwards in 5s from 9 125 to 8 980.
5.4 Count on in 10s from 8 960 to 9 020. Count backwards in 10s from 5 100 to 4 980.
5.5 Count on in 25s from 7 625 to 7 750. Count backwards in 25s from 10 000 to 9 875.
5.6 Count on in 50s from 8 250 to 8 500. Count backwards in 50s from 9 750 to 9 500.
5.7 Count on in hundreds from 5 400 to 6 000. Count backwards in 100s from 7 000 to 6 000
WRITTEN WORK.
Now use your calculator as an investigative tool and complete the written work:
6. **FLOW DIAGRAMS:**

- Complete this “flow diagram” by following the arrows:

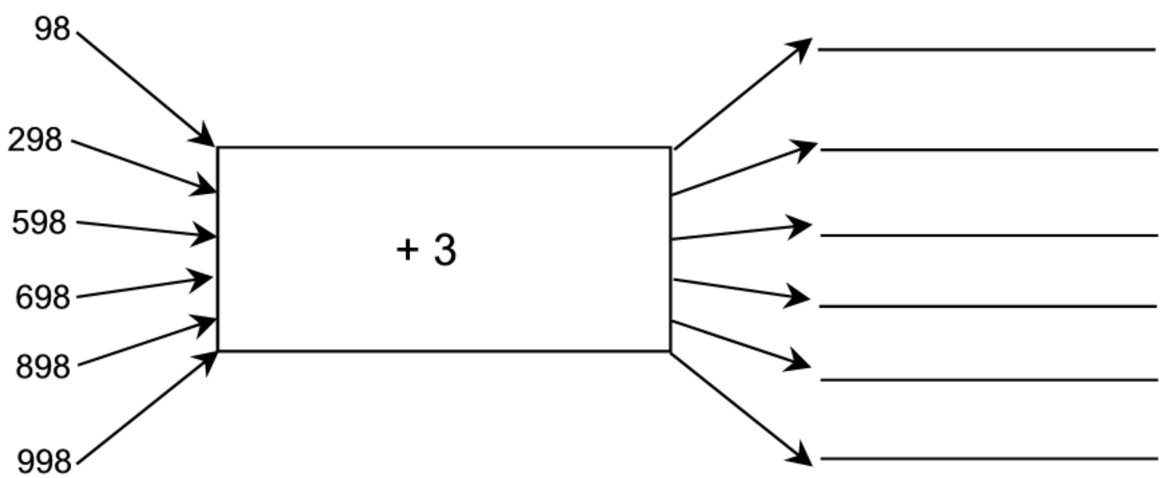

Figure 1.1

- Complete this flow diagram:

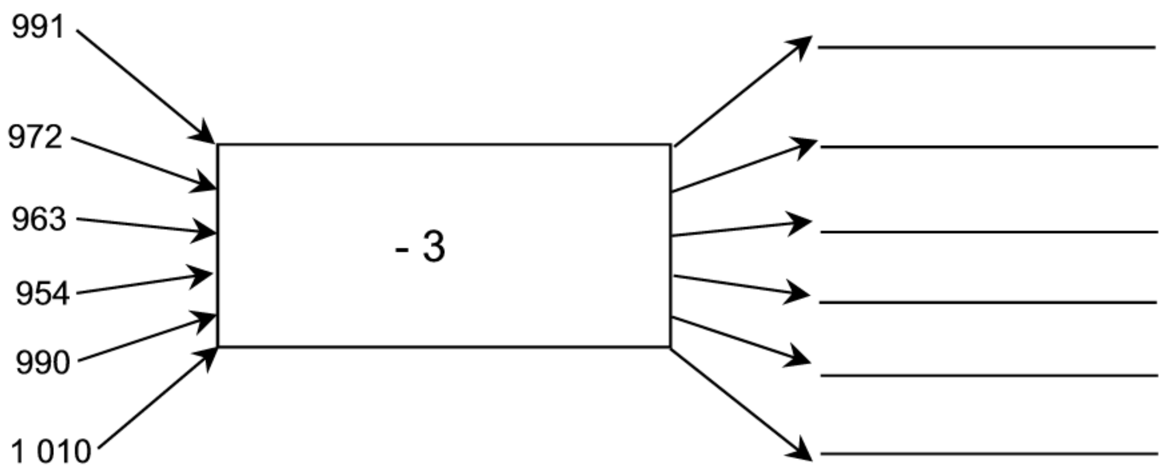

Figure 1.2

7. **A DIFFERENT FLOW DIAGRAM:**

- Fill in the missing operator, the input and output numbers:

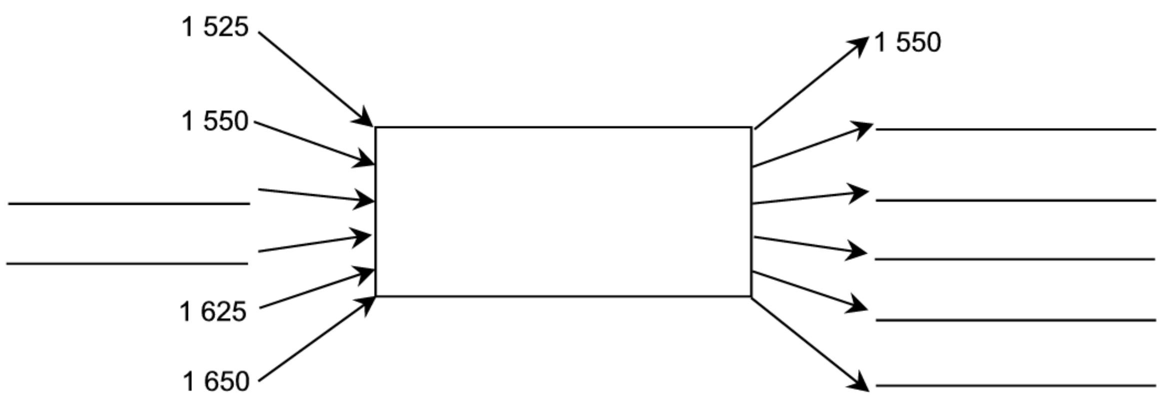

Figure 1.3

8. **MORE LARGE NUMBERS**

Try to programme your calculator it to "count on" or to "count back" as necessary: Complete the following sequences. Remember, you may use your calculator if you wish.

8.1 10 000; 9 998; 9 996; , , ,

8.2 1 950; 1 960; 1970; , , ,

8.3 9 450; 9 550; 9 650; 9 750; , , ,

8.4 8 825; 8 820; 8 815; , , , ,

9. **LARGER NUMBERS IN A FLOW DIAGRAM:**

- Write down the missing input numbers, operator and output numbers:

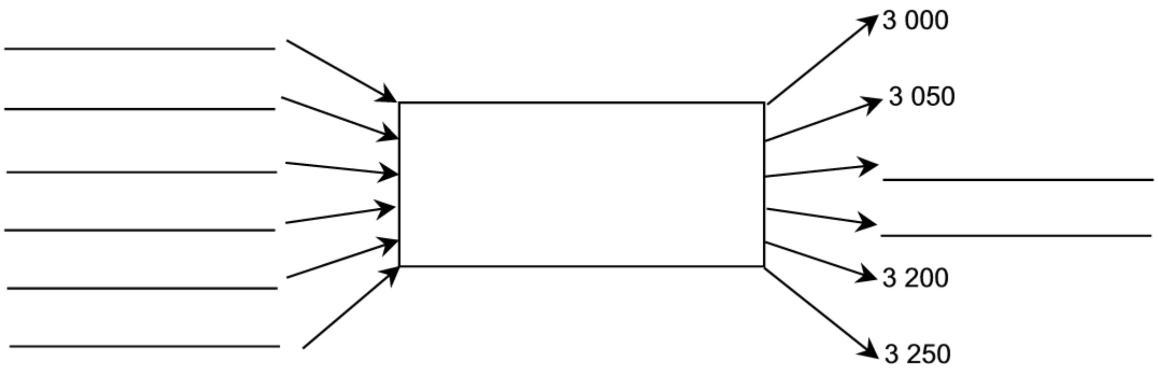

Figure 1.4

10. **COUNTING IN INTERVALS OF FOUR**

- Now encircle all the numbers that you would use when you count in 4s up to 10 000.

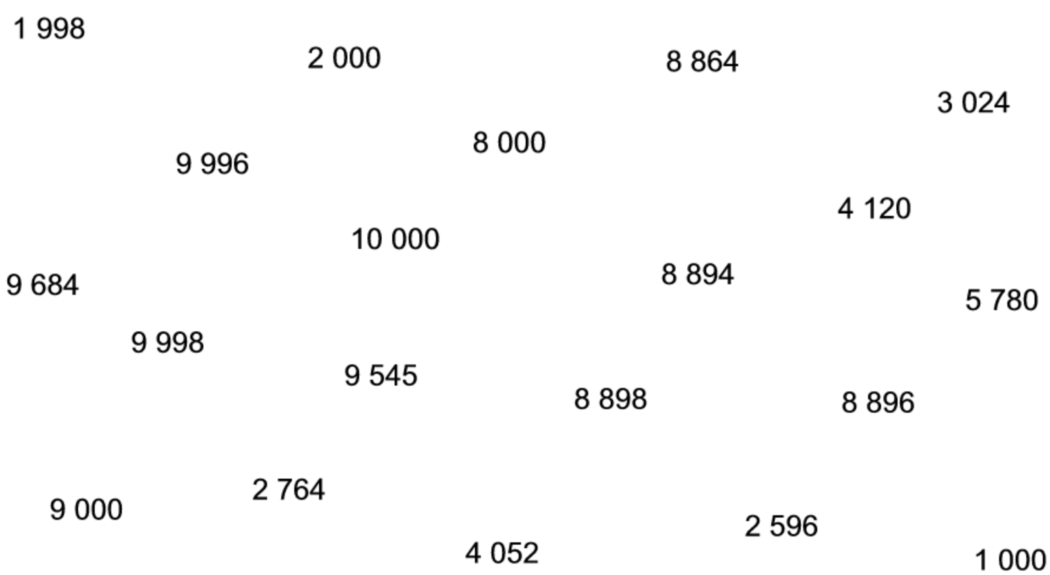

Figure 1.5

Check with a friend, and, if necessary, a calculator.

1.1.6 Assessment

Learning outcomes(LOs)
LO 1
Numbers, Operations and RelationshipsThe learner will be able to recognise, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.
Assessment standards(ASs)
We know this when the learner:
1.1 count forwards and backwards in a variety of intervals (including 2s; 3s; 5s; 10s; 25s; 50s and 100s) between 0 and 10 000;
1.2 describes and illustrates various ways of counting in different cultures (including local) throughout history;
1.3 recognizes and represents the following numbers in order to describe and compare them:1.3.1 whole numbers to at least 4-digit numbers;
1.4 recognizes the place value of digits in whole numbers to at least 4-digit numbers;
1.6 solves problems in context including contexts that may be used to build awareness of other Learning Areas, as well as human rights, social, economic and environmental issues such as:1.6.1 financial (including buying and selling, and simple budgets);
1.7 solves problems that involve: • comparing two or more quantities of the same kind (ratio).
1.8 estimates and calculates by selecting and using operations appropriate to solving problems that involve: • rounding off to the nearest 10; 100 or 1 000;
1.9 performs mental calculations involving: addition and subtraction: • adding and subtraction;
1.10 uses a range of techniques to perform written and mental calculations with whole numbers including: • building up and breaking down numbers; • rounding off and compensating; • doubling and halving; • using a number-line; • using a calculator.
1.11 uses a range of strategies to check solutions and judge the reasonableness of solutions.
continued on next page

Table 1.1

Memorandum

1.1.7 Memorandum

COUNTING IN THE EVERYDAY WORLD

- 594; 596; 598; 600; 602
- 985; 990; 995; 1 000; 1 005
- 670; 680; 690; 700; 710
- 750; 775; 800; 825; 850
- 800; 850; 900; 950; 1 000; 1 050
- 700; 800; 900; 1 000; 1 100
- 1 402 km
- COUNTING WITH A CALCULATOR

3. COUNTING FORWARDS AND BACKWARDS
3.1 186; 188; 190; 192; 194; 196; 198; 200; 202; 204
206; 204; 202; 200; 198; 196; 194;
3.2 0; 3; 6; 9; 12; 15; 18; 21; 24; 27; 30; 33; 36
36; 33; 30; 27; 24; 21; 18; 15; 12; 9; 6; 3; 0
3.3 375; 380; 385; 390; 395; 400; 405; 410; 415; 420; 425
545; 540; 535; 530; 525; 520; 515; 510; 505; 500; 495; 490; 485;
3.4 950; 960; 970; 980; 990; 1 000; 1 010; 1 020
950; 940; 930; 920; 910; 900; 890; 880; 870; 860; 850; 840
3.5 625; 650; 675; 700; 725; 750; 775; 800; 825; 850; 875 900; 925; 950; 975; 1 000
975; 950; 925; 900; 875; 850; 825; 700; 775; 750; 725; 600; 675
3.6 500; 550; 600; 650; 700; 750; 800; 850; 900; 950;
1 000; 1 050
750; 700; 650; 600; 550; 500; 450; 400; 350
3.7 400; 500; 600; 700; 800; 900; 1 000; 1 100
1 000; 900; 800; 700; 600; 500; 400; 300; 200; 100; 0
4. COUNTING: (practice)
5. COUNTING WITH LARGER NUMBERS (Oral individual work; control with a calculator if necessary.)
5.9 980; 9 982; 9 984; 9 986; 9 988; 9 990; 9 992; 9 994; 9 996; 9 998; 10 000
5 010; 5 008; 5 006; 5 004; 5 002; 5 000; 4 998; 4 996; 4 994; 4 992; 4 990
5.2 8 982; 8 985; 8 988; 8 991; 8 994; 8 997
5.2 (cont.) 1 836; 1 833; 1830; . . . 1 800
5.3 4 870; 4 875; 4 880l; . . . 5 015
9 125; 9 120; 9115; . . . 8 980
5.4 8 960; 8 970; 8 980; . . . 9 020
5 100; 5 090; 5080; . . . 4 980
5.5 7 625; 7650; 7675; . . . 7 750
10 000; 9 975; 9 950; . . . 9 870
5.6 8 250; 8 300; 8 350; . . . 8 500
9 750; 9 700; 9 650; . . . 9 500

- 5 400; 5 500; 5 600; . . .6 000

7 000; 6 900; 6 800; …6 000

Flow Diagrams

6. FLOW DIAGRAMS

6.1

98 + 3 = 101

298 + 3 = 301

598 + 3 = 601

698 + 3 = 701

898 + 3 = 901

998 + 3 = 1001

6.2

991 − 3 = 988

972 − 3 = 969

963 − 3 = 960

954 − 3 = 951

990 − 3 = 987

1 010 − 3 = 1 007

7.

1 525 + 25 = 1 550

1 550 + 25 = 1 575

1 575 + 25 = 1 600

1 600 + 25 = 1 625

1 625 + 25 = 1 650

1 650 + 25 = 1 675

8. MORE LARGE NUMBERS

3.1 9 994; 9 992; 9 990; 9 988

3.2 1 980; 1 990; 2 000; 2 010

3.3 9 850; 9950; 10 050; 10 150

3.4 8 810; 8 805; 8 800; 8 795

9. LARGER NUMBERS IN A FLOW DIAGRAM

2 950 + 50 = 3 000

3 000 + 50 = 3 050

3 050 + 50 = 3 100

3 100 + 50 = 3 150

3 200 + 50 = 3 250

10.

The only numbers *not* encircled are:

1 998

9 998

9 545

7 894

7 898

1.2 The place value of digits in whole numbers[2]

1.2.1 MATHEMATICS

1.2.2 Grade 4

1.2.3 WHOLE NUMBERS AND THEIR RELATIONSHIPS

1.2.4 Module 2

1.2.5 THE PLACE VALUE OF DIGITS IN WHOLE NUMBERS

Activity:

Recognise the place value of digits in whole numbers [LO 1.4]

Recognise and represent whole numbers in order to describe and compare them [LU 1.3]

OUR MODERN NUMBER SYSTEM: THE DECIMAL SYSTEM

- Now that we have done oral counting exercises and mental calculations, we think about *the meaning* of our wonderful number system.
- See what Johnny says about Susie. This sounds strange doesn't it?

Figure 1.6

- 1+ 1 is not eleven! But look at Roman numerals: I + I = II. Then it would be correct, because II is the way the Romans wrote 2. In Activity 5 we shall learn more about Roman numerals.

1. Now let's look at a bigger number. Just what does the number 1 111 mean, and why? Try to write down what it means:

One might say this is what it means:

[2]This content is available online at <http://cnx.org/content/m30494/1.1/>.

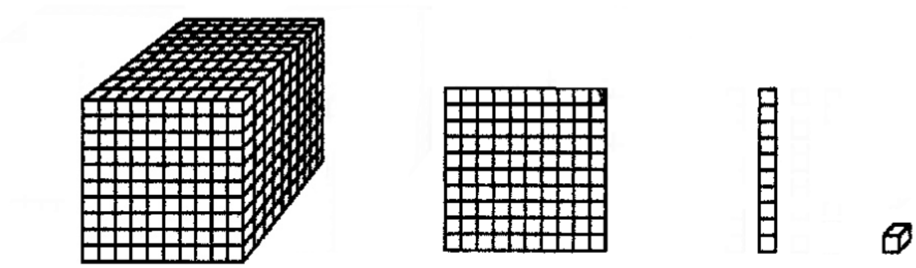

Figure 1.7

2. What number do you think this diagram represents?

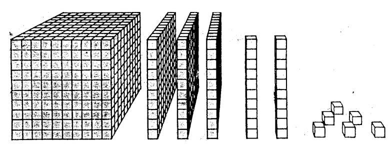

Figure 1.8

- Our decimal system works in groups of loose ones (units), tens, hundreds, thousands and ten thousands. We can have up to nine loose blocks. If we get one more, we say we have ten blocks/ 10 that is, one group of ten and nothing left loose. The "0" fills the empty place to say there is nothing left. With blocks, it would look like this:

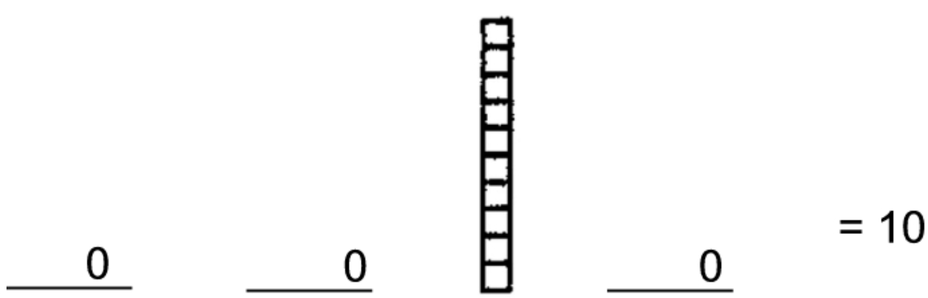

Figure 1.9

- Because we cannot always draw blocks, we use the POSITION of the digits to tell us the size of the group. So we have place value:

THOUSANDS	HUNDREDS	TENS	UNITS
1 000	100	10	1
10 x 10 x 10	10 x 10	10	1

Table 1.2

Recap: Our Decimal Number System

In our number system we have nine symbols and “0”. We use these symbols, 1; 2; 3; 4; 5; 6; 7; 8; 9 and 0 to make any and all the numbers we need. We use the position of the digit in the number to indicate its value. So in the number 2 768 the 7 means 700 because of where it is in the number.

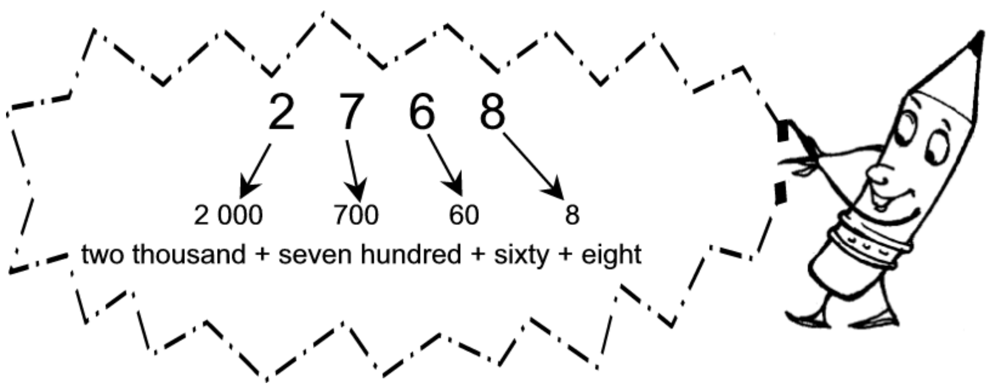

Figure 1.10

If there are no thousands (or digits in the other columns) we use 0 as a place holder.

Note: the 0 cannot be left out. If we left out the 0 the value of the whole number would change (e.g. 10 291 would become 1 291) so the 0 is very important.

1. Now write each of the numbers below in EXPANDED NOTATION. The one at the top of the page looks like this: 2 768 = 2 000 [U+F02B] 700 [U+F02B] 60 [U+F02B] 8

Now complete the ones below:

2 768 = 2 000 [U+F02B] 700 [U+F02B] 60 [U+F02B] 8
7 834 =
2 056 =
8 503 =
1 940 =
16 473 =
25 809 =

Table 1.3

Note also:

When we write big numbers we leave a space between the thousands and the hundreds. This makes it easier to read the number. Key 10 403 into your calculator. Unfortunately the calculator does not leave this space. Do you see it is not so easy to read this number on the calculator when there is no space between the thousands and the hundreds? Remember to leave the space in the correct place when you are writing big numbers.

MAKING NUMBERS AND ARRANGING THEM IN ORDER

- We have seen how each digit in a number has a value, for example:

3 967 = 3 000 [U+F02B] 900 [U+F02B] 60 [U+F02B] 7.

It can be written in columns like this:

THOUSANDS1 000	HUNDREDS100	TENS10	UNITS1
3	9	6	7

Table 1.4

Because there are:

3 × 1 000 [U+F02B] 9 × 100 [U+F02B] 6 × 10 [U+F02B] 7

4. Now create the largest and the smallest numbers with the digits: 2; 8; 4; 1. Write them and two other numbers, still using only the digits 2; 8; 4; 1 in columns:

Which of your numbers above is the largest number?

- Now write your numbers. Begin with the largest, then the next largest, then the next largest, until you reach the smallest. This is called DESCENDING ORDER. (Moses DESCENDED from the mountain)

Descending order is when you start with the largest number and go **D**own

Example: 10; 9; 8; 7; 6; 5; 4; 3; 2; 1

4.2 Ascending order is when you start with the smallest and go up! Now write your numbers in ascending order. Remember to begin with the smallest:

4.3 Write these numbers from the smallest to the largest:

6 095; 9 065; 6 059; 9 506; 5 069

4.4 Write these numbers from the largest to the smallest:

8 315; 3 851; 5 318; 1 853; 8 513

5. **EVEN AND ODD NUMBERS**

5.1 Study the number line below:

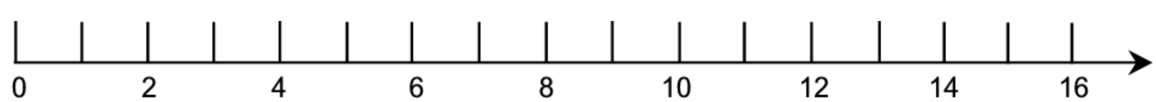

Figure 1.11

All the numbers that have been written there are even numbers. They can be shared equally between two friends.

5.2 Between the even numbers are odd numbers. They cannot be kept whole and shared equally between two people. Fill in the names of the odd numbers on the number line below:

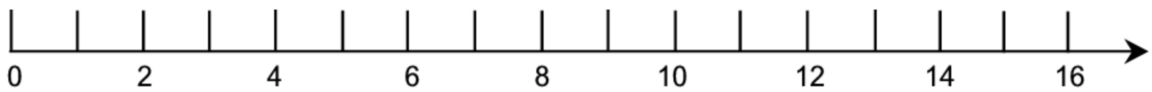

Figure 1.12

TEST YOUR KNOWLEDGE of odd and even numbers
a. List the even numbers between 2 800 and 2 812
b. Which odd number is just before 10 000?
c. What is the first even number after 2 998?

6. **LARGER AND SMALLER**

LARGER THAN / SMALLER THAN
In Mathematics, this sign > means: LARGER THAN or GREATER THAN:
This sign < means: SMALLER THAN or LESS THAN
(Remember, the crocodile always opens his mouth towards the largest number because he is so hungry!)

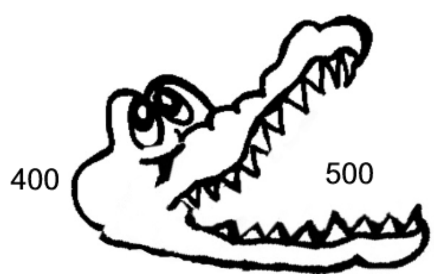

Figure 1.13

500 > 400
or 500 is greater than 400
< 500
or 400 is less than 500
TEST YOUR UNDERSTANDING OF THESE SIGNS:

- Fill in the correct sign from : <; =; >

a) 0 [U+F02B] 4 * 11 - 3
b) 13 - 6 * 0 [U+F02B] 7
c) 2 [U+F02B] 7 * 14 - 8
d) 13 - 5 * 7 [U+F02B] 4
6.2 Write down the missing number when you count in tens:

1 470 < ………………………… < 1 490.

7. **CALCULATOR GAME**

Now you may play another calculator game. Try to puzzle out what the learners are doing this time. Then play the game with your friend.

Figure 1.14

Paul keyed in 187. He keyed in one operator and pressed = and the number 1 870 appeared on the screen. What operator did he key in? Yes, it was: X 10 because 187 X 10 = 1 870.

What operator did Reyhana key in? Yes, it was also X 10 because 1 870 X 10 = 18 700.

8. Now see if you can complete this table without a calculator. Then check your answers with a friend. (If you get stuck you may use a calculator.)

Number	Operator	Answer
58	X 100	
145	X 10	
309		3 090
20	[U+F0B8] 10	
1 000		10 000
520		52
1 690	[U+F0B8] 10	
1 000	[U+F0B8] 100	
10 000	[U+F0B8] 10	

Table 1.5

16 329

Hello! I am called Six Thousand. I am part of a very large number, which is: Sixteen thousand three hundred and twenty-nine.

9. Now write down **the value** of the digit that has been printed in bold type:

3 421

8 035

9**2**6

14 051

Now let us look at the number 2 **848**.

The 8 on the **left** means 800. The 8 on the **right** means 8.

What is *the difference betweenthe values* of the two 8s?

800 - 8 = 792

10. Now **calculate the difference between the value**s of the numbers that have been made bold and underlined:

7 37**4**

6 **99**5

3 02**3**

5 **5**19

10 0**1**0

11. Now you may play a "place value" game with a friend and a calculator. This will strengthen your understanding of "place value". It is important to play this game.

See if you can learn this game by reading what the two learners said:

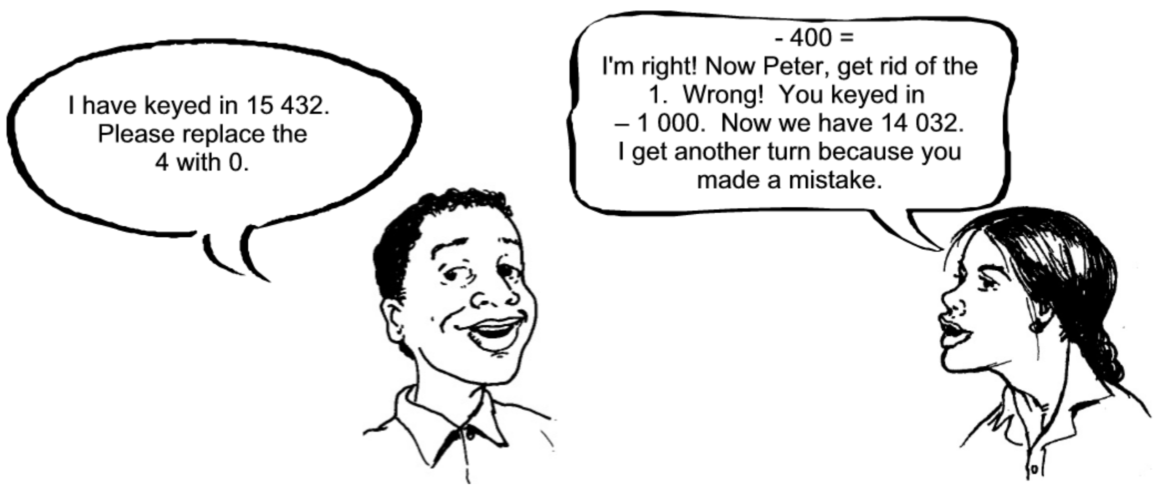

Figure 1.15

The game continues until all the digits have been replaced by 0.

12. Now that you have played the "place value" game, try to do this exercise. Replace the digit that has been made bold (dark) with 0. (The first two have been done for you.)

Number, bold digit to be replaced by 0	My suggestion: what to do.	Calculator answer	Π	ρ	What I should have done:
1 35**6**	- 6 =	1 350	Π	-	-
2519	- 200 =	2 319		ρ	- 2 000 =
6 **7**23					
15 6**3**8					
13 642					
1**7** 389					
*5*90					
14 84*3*					
7**3**94					

Table 1.6

1.3 Look at the first one again. Would it be correct to say [U+F02B] 4? Yes, that is correct: 1 35**6** [U+F02B] 4 = 1 36**0** so we have replaced the 6 with a 0!

TEST YOUR SKILLS: PLACE VALUE and DESCRIBING AND COMPARING WHOLE NUMBERS

Now that you have learnt all about the importance of place value see if you can use this know ledge to complete the following exercises:

1. Write down the number that consists of:

6 000 [U+F02B] 0 [U+F02B] 20 [U+F02B] 9

2.1 Write the largest possible whole number with the digits:

6 ; 0; 9; 2; 7

2.2 Write down the odd number immediately before 4 521.

2.3 Write down the next even number:3 008.

3. What is the value of: the 6 in 1**6** 708?

4. The number 17 538 is on the screen of my calculator. How can I change the 7 to 0 by keying in one instruction and = ?

5. Write down the whole number:

5.1 that is just before 10 000

5.2 that is just after 1 000

5.3 that is greater than 998 and less than 1 000

5.4 that is between 5 009 and 5 011

6. Write down the answers:

- 347 - 47 =
- 347 - 37 =
- 254 - 54 =
- 254 - 64 =
- 254 - 44 =

TESTING YOUR PROGRESS SO FAR

18 $\underline{4}$08

1. Use the number in the frame to complete the following:

- What Number System do we use?

- What number symbols do we use to make all our numbers? Write them all down:

- Write down the value of the underlined figure in the frame above.

1.4 Write down the value of the 8.

a) on the left ………………… b) on the right……….…………….

1.5 What number will you have if you leave out the "0"?
1.6 Add 4 to the number in the frame 18 408 + 4 =
1.7 Write the number in the frame in expanded notation:
1 × ……………….. + 8 × ……………….. + 4 × ……………...+ ……….. . × 10 + ……….. .
1.8 You are counting in 2s. Begin with the number in the frame and write down *the next* 5 numbers:
2. Write down the missing numbers in this sequence:
18 408; 18 508; 18 608; 18 708; ……………...; …………………...; …………………

1.2.6 Assessment

Learning outcomes(LOs)
LO 1
Numbers, Operations and RelationshipsThe learner will be able to recognise, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.
Assessment standards(ASs)
We know this when the learner:
1.1 count forwards and backwards in a variety of intervals (including 2s; 3s; 5s; 10s; 25s; 50s and 100s) between 0 and 10 000;
1.2 describes and illustrates various ways of counting in different cultures (including local) throughout history;
1.3 recognizes and represents the following numbers in order to describe and compare them:1.3.1 whole numbers to at least 4-digit numbers;
1.4 recognizes the place value of digits in whole numbers to at least 4-digit numbers;

Table 1.7

1.2.7 Memorandum

ACTIVITY 1: PLACE VALUE
1. 1 000 + 100 + 10 + 1
2. 1 000 + 300 + 20 + 6 = 1 326
3. 7 834 = 7 000 + 800 + 30 + 4
2 056 = 2 000 + 0 + 50 + 6
8 503 = 8 000 + 500 + 0 + 3
1 940 = 1 000 + 900 + 400 + 0
16 473 = 10 000 + 6 000 + 400 + 70 + 3
25 809 = 20 000 + 5 000 + 800 + 0 + 9
4. Note: using 2; 8; 4; 1 there can be many numbers; room has been given for 4 numbers only, so all

THOUSANDS1 000	HUNDREDS100	TENS10	UNITS1
2	8	4	1
2	4	8	1
2	1	8	4
2	8	1	4
2	4	1	8
2	1	4	8
8	4	2	1
8	4	1	2
8	2	4	1
8	2	1	4
8	1	2	4
8	1	4	2
4	8	2	1
4	8	1	2
4	2	8	1
4	2	1	8
4	1	8	2
4	1	2	8
1	8	2	4
1	8	4	2
1	4	8	2
1	4	2	8
1	2	8	4
1	2	4	8

Table 1.8

Possibly not all learners will notice that there could be all these numbers, but some learners are sure to do so. This could start valuable discussion. The largest possible number is 8 421. The smallest is 1 248.

4.1 Again only 4 steps have been provided. Check that their answers are in descending order, e.g. 8 421; 4 821; 2 841; 1 248

Note: it is not necessary for the learners to put all the possible numbers into descending order; four numbers are sufficient to show that they understand the meaning of descending order.

4.2 Again, four numbers are sufficient to show that the learner understands the meaning of ascending order. Please check each learner's answers.

E.g.: 1 248; 2 148; 4 218; 8 421

4.3 5 069; 6 059; 6 095; 9 065; 9 506

- 8 513; 8 315; 5 318; 3 851; 1 853

- 1; 3; 5; 7; 9; 11; 13; 15

TEST YOUR KNOWLEDGE: odd and even numbers

1. 2 802; 2 894; 2 806; 2 808; 2 810
2. 9 999
3. 3 000

6.LARGER AND SMALLER [U+F03E]; < ; =

6.1 (a) < (b) = c) [U+F03E] (d) <

- 1 480

7.

Number	Operator	Answer
58	X 100	5 800
145	X 10	1 450
309	X 10	3 090
20	[U+F0B8] 10	2
1 000	X 10	10 000
520	[U+F0B8] 10	52
1 690	[U+F0B8] 10	169
1 000	[U+F0B8] 100	10
10 000	[U+F0B8] 10	1 000

Table 1.9

9. 3 000; 8 000

20; 10 000

10.

7 374	7 000 –70 = 6 930
6 995	9 00 – 90 = 810
3 023	3 000 – 3 = 2 997
5 519	5 000 – 500 = 4 500
2 454	400 –4 = 396
10 010	10 000 – 10 =9 990

Table 1.10

11. Game
12. The first two are examples:

Number, bold digit to be replaced by 0	What to do	Calculator answer			
1 35**6**	- 6or: + 4	1 3501 360			
2 519	- 200	2 319		$\times$	- 2 000 =
6 **7**23	- 700or: + 300	6 0237 023			
15 6**3**8	- 30or: + 70	15 60815 708			
13 642	-10 000or: + 90 000	3 642103 642			
1**7** 389	- 7 000or: + 3 000	10 38920 389			
590	- 500or: + 500	901 090			
14 84**3**	- 3or: + 7	14 84014 850			
7 **3**94	- 300or: + 700	7 0948 094			

Table 1.11

13. Yes
TEST YOUR SKILLS: PLACE VALUE

1. 6 029

- 97 620 2.2 4 519 2.3 3 010

3. 6 000

1. - 7 000 of + 3 000

- 9 999 5.2 1 001
- 999 5.4 5 010

- 300
- 310
- 200
- 190
- 210

TESTING YOUR PROGRESS SO FAR

- Decimal
- 0; 1; 2; 3; 4; . . . 9
- 400
- (a) 8 000 (b) 8
- 1 848
- 18 412
- 1 x 10 000 + 8 x 1 000 + 4 x 100 + 0 + 8
- 18 410; 18 412; 18414; 18 416; 18 418

2. 18 808; 18 908; 19 008

1.3 Written and mental calculations with whole numbers[3]

1.3.1 MATHEMATICS

1.3.2 Grade 4

1.3.3 WHOLE NUMBERS AND THEIR RELATIONSHIPS

1.3.4 Module 3

1.3.5 WRITTEN AND MENTAL CALCULATIONS WITH WHOLE NUMBERS

Activities:

- Use a range of techniques to perform written and mental calculations with whole numbers [LO 1.10]
- Estimate and calculate by selecting and using operations appropriate to solving problems [LO 1.8]
- Solve problems that involve comparing two or more quantities of the same kind (ratio) [LO 1.7]
- Use a range of strategies to check solutions and judge their reasonableness [LO 1.11]

FINDING APPROXIMATE ANSWERS AND CHECKING ANSWERS

Now that you have studied “Place Value”, we are going to look at “Rounding Off” numbers so that we can use this to:

- calculate approximate answers quickly and also
- check our answers quickly.

1. APPROXIMATING, BY ROUNDING OFF

Consider the following:

1.1 You are riding your bike from your home to the home of a friend who lives 10km away. Your tyre bursts when you have gone 4km. Will you decide to walk home to fix it or go on to your friend?

Yes, you’ll walk home because it’s nearer. 4 is nearer to 0 than to 10

1.2 Now the tyre bursts when you have ridden 6km. Will you decide to walk to your friend’s home or back to your own home?

Yes, you’ll go on to your friend’s home because it is nearer.

6 is nearer to 10 than to 0.

1.3 Now the tyre bursts when you have ridden 5km exactly. Should you decide to walk to your friend’s home or back to your own home?

In Mathematics, *always round off upwards* **if the last digit is 5.**

- Now use the diagrams that we have just seen to help you to complete the table:

Number	Rounded off to the nearest 10
54	
1 345	
278	
978	
245	
1 133	
684	

[3]This content is available online at <http://cnx.org/content/m30496/1.1/>.

Table 1.12

1.5 Now we are going to use "rounding off" to calculate, quickly, an *approximate answer* for the following sums, and then we shall calculate the *exact answer*, and compare the difference between the two answers. Fill in what is missing in each column:

Sum	Numbers rounded off to the nearest 10	Approximate answer	Exact answer	Difference between the 2 answers
24 + 36	20 + 40			
52 + 48	50 + 50			
33 + 52				
79 + 23				
17 + 47				
125 + 46				
411 + 732				

Table 1.13

1.6 Look at the sums that you have just completed. In which sums was the approximate answer and the exact answer not very close, and why?

ROUNDING OFF TO THE NEAREST 100:

1.7 Complete the table below. .

Number	Rounded off to the nearest 100
256	
304	
549	
1 207	
1 399	

Table 1.14

ROUNDING OFF TO THE NEAREST 1 000:

1.8 Complete the table below.

Number	Number rounded off to the nearest 1 000
500	
1 702	
4 089	
723	
1 055	
276	

Table 1.15

1.9 Use rounding off to estimate the approximate answer of the following sums. Then calculate the exact answer:

SUM with the exact answer.	Sum with numbers rounded off to the nearest 10 and the estimated answer:
873 + 46	
934 - 87	

Table 1.16

2. **WORD SUMS**

- Now see how well you can solve word sums without a calculator. Check that your answers are reasonable by rounding off the numbers, but remember that your final answer must be the *exact* answer. The numbers are not very big and the sums are straightforward, but you will have to read carefully. Write down all you need to write down, and remember to write words with your answer. When you have finished the sums, compare your findings with those of a friend. Enjoy this task.

2.1 In a General Knowledge Competition the Girls' Team scored 642 points by tea-time. The Boys' Team scored 493 points. By how many points was the Boys' Team behind the Girls' Team?

2.2 By lunch-time the Girls' Team had 734 points and the Boys' Team had 655 points.

a. Was the Boys' Team catching up?
b. Why do you say this? Answer carefully.
c. By how many points was the Boys' Team behind the Girls' Team at lunch-time?

2.3 After lunch, the boys made a determined effort. During the afternoon they scored another 619 points. The girls scored 519 points in the afternoon. When all the points were added up, which team eventually won the competition, and by how much?

3. **CALCULATOR GAME: two players, one calculator**

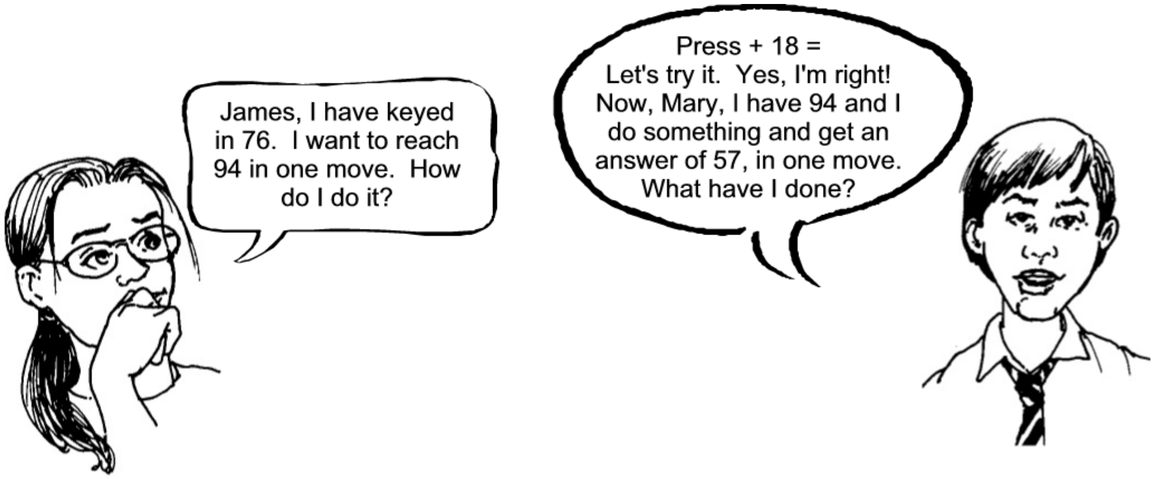

Figure 1.16

- Continue in this manner. If one of the players makes a mistake, correct it and then the other player gets an extra turn to ask a question. Keep the numbers not more than 4-digit numbers at the most. It's valuable to become very good at 2-digit numbers first.
- Complete:

a. $100 - 7 =$
b. $1\ 000 - 7 =$
c. $500 - 7 =$
d. $500 - 17 =$
e. $500 - 27 =$
f. $700 - 70 =$
g. $1\ 000 - 70 =$
h. $2\ 100 - 70 =$
4. **SOME TECHNIQUES to perform written and mental calculations.**

- How can one add $8 + 7$ easily?

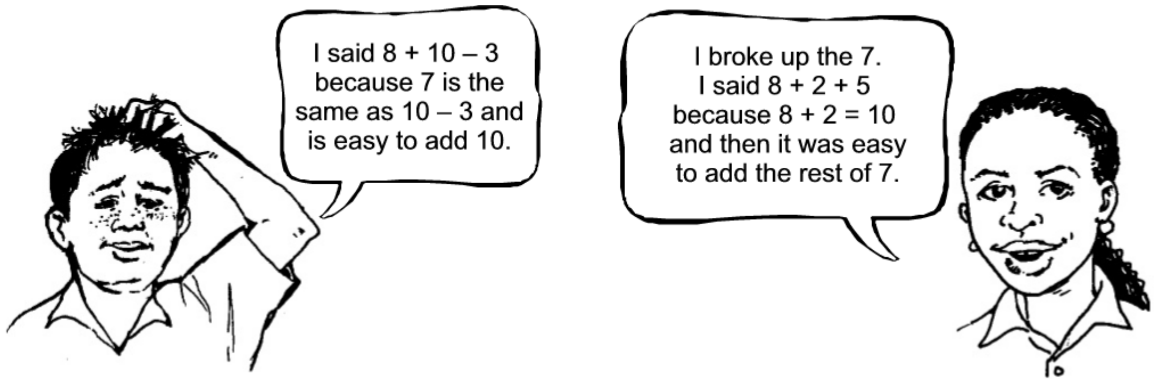

Figure 1.17

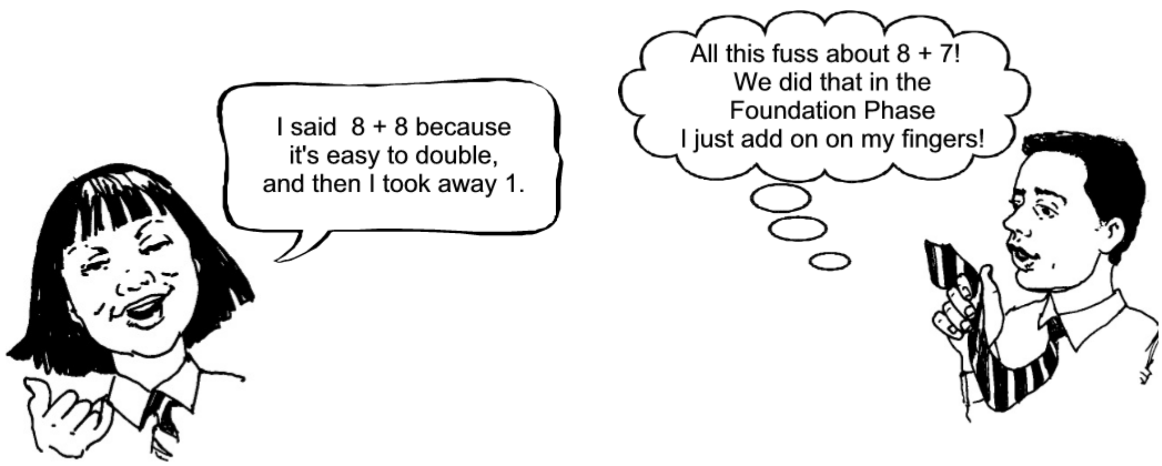

Figure 1.18

4.2 Discuss: which learner was right? What method must you use?

- You must use the method *that you understand best*, the one that you feel comfortable with, and you must also try to listen to others when they explain their methods. But be sure to use the method that you really understand well enough *to explain to others* what you did.4.3 Try to see a link between these sums as you write down the answers

a. $8 + 7 =$
b. $18 + 7 =$
c. $8 + 17 =$
d. $18 + 17 =$
e. $8 - 7 =$

f. 18 – 7 =
g. 28 – 7 =
h. 28 – 17 =
5. Now use your method and try some written sums. Write down all the steps you needed to reach the answer. You may not use a calculator.

- 87 - 54

- 84 - 57
- Now discuss these two sums and their answers with a friend.
- Explain what you noticed.

6. Now calculate, without a calculator and using the method that you feel you understand most. Write down all the steps of your calculation:

- 1 345 + 278

- 978 – 245
- 1 278 + 1 133
- 845 – 672
- 684 – 659

- 4 092 + 3 214

- Check the last sum by rounding off the numbers to the nearest 10 or nearest 100 and then calculating an approximate answer. Then discuss how you reached your answers with a friend. If necessary, check your answers on a calculator.

7. **MORE WORD SUMS**
Sales at a Craft Market for the first 5 months of the year:

Months	Cooldrinks	Hot dogs	Ice-creams	Mugs of Soup
January	3 064	1 754	2 356	225
February	3 215	1 036	2978	54
March	1 964	2 375	2 035	987
April	874	3 752	1 096	1 952
May	756	3 904	788	2 659

Table 1.17

7.1 How many cooldrinks were sold altogether during the five months?
7.2 Were cooldrinks or ice-creams more popular during the five months? Explain why you give this answer.
7.3 Cooldrinks cost R5,00 each. How much money was collected for cooldrinks in May? Try to find an easy way of calculating this and write it down.
7.4 At the beginning of January the ice-cream stall holder buys 24 boxes of ice-creams. Each box contains 100 ice-creams. How many ice-creams are over at the end of the January Market?
7.5 Which month was the coldest? Why do you say so? (Look back at the table showing the sales.)
7.6 Round off the numbers of cups of soup to the nearest 100 and say approximately how many cups of soup were sold altogether.

1.3.6 Assessment

Learning outcomes(LOs)
LO 1
Numbers, Operations and RelationshipsThe learner will be able to recognise, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.
Assessment standards(ASs)
We know this when the learner:
1.7 solves problems that involve: • comparing two or more quantities of the same kind (ratio).
1.8 estimates and calculates by selecting and using operations appropriate to solving problems that involve: • rounding off to the nearest 10; 100 or 1 000;
1.9 performs mental calculations involving: addition and subtraction: • adding and subtraction;
1.10 uses a range of techniques to perform written and mental calculations with whole numbers including: • building up and breaking down numbers; • rounding off and compensating; • doubling and halving; • using a number-line; • using a calculator.
1.11 uses a range of strategies to check solutions and judge the reasonableness of solutions.

Table 1.18

1.3.7 Memorandum

ACTIVITY

1.1 home

1.2 friend's home

1.3 either / friend's home

1.4 50; 1 350; 280; 980; 250; 1 130; 680

1.5

Sum	Numbers rounded off to nearest 10	Approximate answer	Exact answer	Difference
24 + 36	20 + 40	60	60	0
52 + 48	50 + 50	100	100	0
33 + 52	30 + 50	80	85	5
79+ 23	80 + 20	100	102	2
17 + 47	20 + 50	70	64	6
125 + 46	130 + 50	180	171	9
411 + 732	410 + 730	1 140	1 143	3

Table 1.19

1.6 They are close when one number is rounded off upwards and the other, downwards. When both numbers are rounded off upwards, or both are rounded off downwards the totals are not very close, e.g. the third sum; the fifth sum and the last two sums. The rounding off increases the gap.

1.7 300; 300; 500; 1 200; 1 400

1.8 1 000; 2 000; 4 000; 1 000; 1 000; 0

- 873 + 46 = 919;

870 + 50 = 920

934 – 87 = 847;

930 – 90 = 840

2 WORD SUMS

2.1 642 – 493 =149; 640 – 490 = 150

The boys were behind by 149 points.

2.2 (a) Yes

(b) 734 – 655 =79; 730 – 660 = 70

At tea-time the difference between the Girls' points and the boys' was 149 points; at lunch-time the difference was only 79 points, so the boys were catching up.

(c) 79 points, see above

(d) Girls

734 + 519 = 1 253

Boys

655 + 619 = 1 274

The boys won by 21 points.

3.1 Calculator Game

3.2 (a) 93

(b) 993

(c) 493

(d) 483

(e) 473

(f) 630

(g) 930

(h) 2 030

4.1 and 4.2 Discussion: Techniques

4.3 (a) 15

(b) 25

(c) 25

(d) 35

(e) 1
(f) 11
(g) 21
(h) 11
5. WRITTEN SUMS
5.1 33
5.2 27
5.3 and 5.4 discussion and explanation
6.1 1623
6.2 733
6.3 2 411
6.4 173
6.5 25
6.6 7 306
6.7 Checking by rounding off and discussion

- 9 873 cool drinks
- Cool drinks; 620 more cool drinks were sold than ice-creams
- 44 ice-creams were over
- Hot dogs
- May; many hot-dogs and mugs of soup were sold; few cool drinks and ice creams were sold.
- 6 000 cups of soup

1.4 Financial problems and drawing up a budget[4]

1.4.1 MATHEMATICS

1.4.2 Grade 4

1.4.3 WHOLE NUMBERS AND THEIR RELATIONSHIPS

1.4.4 Module 4

1.4.5 FINANCIAL PROBLEMS AND DRAWING UP A SIMPLE BUDGET

Activity:

To solve problems in context including economic and environmental issues such as: financial problems and drawing up a simple budget [LU 1.6]

1. **MONEY MATTERS**

In the Foundation Phase you discovered how many cents, 2-cents, 5-cents etc. there are in R1. Now see how clever you are!

[4]This content is available online at <http://cnx.org/content/m30497/1.1/>.

Question	Answer
1.1 How many cents are there in R5?	cent
1.2 How many cents are there in R50?	cent
1.3 How many 5-cent pieces are there in R1?	five-cent pieces
1.4 How many 5-cent pieces are there in R10?	five-cent pieces
1.5 How many 5-cent pieces are there in R100?	five-cent pieces
1.6 How many 10-cent pieces are there in R1?	ten-cent coins
1.7 How many 10-cent pieces are there in R100?	ten-cent coins
1.8 How many 50-cent pieces are there in R1?	fifty-cent pieces
1.9 How many 50-cent pieces are there in R10?	fifty-cent pieces
1.10 How many 50-cent pieces are there in R20?	fifty-cent pieces

Table 1.20

Many shops do not use 1c pieces any longer.

2. **SHOPPING FOR STATIONERY**

Before school started at the beginning of the year, you had to do some shopping at the hypermarket. The prices of the different items are shown in the next frame.

Sharpener	R5	Felt pens (colour)	R10
Glue stick	R4	Geometry set	R20
Exercise book	R3	"Flip file"	R10
Pencil crayons (small box)	R14	2 pencils	R8
Pen (roller-ball)	R15	Writing pad	R6
Calculator	R49	Pair of scissors	R7
Diary	R15	Ruler	R5
Eraser	R6		

Table 1.21

2.1 How much in total would each child have had to pay the cashier if he/she had bought the following items:

a. Jane bought a diary and a ruler.
b. Andrew bought a calculator, a writing pad and 2 pencils.
c. Hetty bought a set of pencil crayons and a glue stick.
d. Mandy bought a pen, a ruler, an eraser and a pencil sharpener.
e. Brian bought an exercise book, a diary, a writing pad and a pen.

2.2 How much did all the above children spend on stationary altogether?

3. **MONEY IN SHOPS**

3.1 In the large shops, the prices of items include cents. Cashiers, however, do not worry with one-cent and two-cent pieces. Cashiers always take your change up to the next 5c. Thus, if you should receive 17c change, you will be given 20c. Change is always “taken upwards”; this is not rounding off. Why do you think

shops do this? Do shops lose much money because of this? Discuss this with your friends and then write down your answer.

3.2 Now pretend that you are working behind a till in a shop. The till tells you how much change you must give to each customer, but you must decide which notes and coins to give. You have to give the fewest notes and coins possible.

Now complete the table (the first one has been done for you):

Notes and Coins[U+F0AF]	Amounts of change to be givenR78,76 * R 30,45 * R 43,62 * R 21,94 * R120,13 * R0,55					
R100						
R50	1					
R20	1					
R10						
R5	1					
R2	1					
R1	1					
50c	1					
20c	1					
10c	1					
5c						

Table 1.22

3.3 Remember that it is the change is rounded off upwards, not the amount that the customer owes. If the change should be R78,76, what is the customer actually given?

4. **AT SCHOOL: BELONGINGS: GROUP DISCUSSION AND PROBLEM SOLVING**

The "Lost Property" box was full of equipment! The educator was tired of picking up the belongings that had been left on the floor and desks. She told the learners that, if nobody had claimed these belongings by the end of the week, she would give the most well-mannered learners a chance to choose 2 different items from the box and these would then be their property. For example, one combination might be a pencil and a ruler or a pencil and a sharpener or a glue stick and a pencil There was much excitement as the learners tried to decide which two items they would choose.

a. How many different combinations of 2 different items could they make if there were pencils, rulers, erasers, sharpeners, glue sticks and pairs of scissors in the box? Try to write down a systematic way of working out the answer. Then compare your method with that of a friend.

5. **BUDGETS:**

Should Grade 4 learners worry about a simple budget? Yes, they should become aware that it is necessary to plan concerning one's money.

What is a budget? It's a plan to show what money will come in, and what will be spent.

5.1 GROUP WORK: AN INVESTIGATION

How do I go about drawing up a budget? See the budget lay-out below. Discuss it and then fill in likely amounts.

BUDGET FOR A FAMILY OF FOUR PEOPLE FOR ONE MONTH

	Budgeted (Planned)	Actual
INCOME (money coming in)		
• Salaries • Other income (selling vegetables; washing cars; delivering newspapers; craft market sales) • Total:		
EXPENDITURE (Spent)		
What has to be spent each month: • Rent • Electricity and water • Telephone • Insurance • Medical aid • School fees • Transport • Food/ household • Medical expenses • Clothing • Total:		

Table 1.23

Take the "Total Spent" away from the "Total Income". What's left for a holiday or entertainment? (Now are you going to beg for another video and expensive "takkies"?)

- Now we shall do some practical research to complete a project.

PROJECT: BUDGETS: USE YOUR KNOWLEDGE

All the items mentioned in this project must be worked to the nearest whole rand. (So if Coke costs R15,99 you will call it R16.)

You and some friends are going to prepare the evening meal for Mother's Day. There will be twelve people altogether at this meal. Your older sister says she will help you with the stove, and your father says that if you have a braai, he will see to the fire. You earn money to buy food for the meal. Altogether you have R150. Now you are going to draw up a budget or plan to show how you think you will spend the money.

a. First you need to decide whether you want to cook inside or have a braai. Look at the money! At the time of writing, twelve lamb chops and some sausage could easily cost R100. On the other hand, if you made savory mince or cottage pie or bobotie or spaghetti bolognaise, one and a half kg of mince would probably cost about R25. Now make a list of *all* the things you want to buy.

a. Now decide *how much* of each item you need. Write the amount next to the item in your list.

c. Now look at the advertisements of a local chain store in the paper, or visit a store and work out how much each item will cost. Also decide which is cheaper e.g. tins of Coke or bottles, and which size you want. Remember, you cannot spend more than your Income. Decide which items you simply *must* have.

Make a new list with the most important items first. Write down the amount and the cost of each item. (Maybe you would like to consult an older person.)

Item	Amount needed	Price per unit	Total Price

Table 1.24

d. Now draw up your budget by filling in the table below. First write R150 under “ Actual Income”. That is all you have to spend! Now write down all the things that you want to buy under the heading, “Expenditure”. Start with the most important item. Write the total price of each item under the heading, “Cost in R”

BUDGET FOR A GRADE 4 BRAAI

INCOME	ACTUAL INCOME
Money earned	
EXPENDITURE	Cost in R
FINAL TOTAL	

Table 1.25

Now remember to take *the amount spent away* from the “Income”. Is there enough money for paper plates and cups?

1.4.5.1 TEST YOUR PROGRESS

Let’s have another look at how you’re coping.

1. Round off to the nearest:

	Ten	Hundred	Thousand
1 387			
925			
4 813			
6 492			
9 509			

Table 1.26

2. In each sum, estimate the approximate answer by rounding off the numbers to the nearest hundred. You do not need to calculate the exact answer:

- 7 462 + 2 948
- 9 476 - 4 508

3. Money

- How many 1c pieces are there in R50?
- How many 5c pieces are there in R50?

4. Calculate, writing down all your steps clearly:

- 5 907 + 3 754
- 6 098 - 3 274
- 1 234 [U+F02B] 768 [U+F02B] 630 [U+F02B] 266

CALCULATORS AND WORD SUMS

You may use your calculator to find the answers in this section.

5. Read this sum carefully and answer the questions. Write down some proof to show how you reached each answer.

A professional gardener, Mr Gouws, prunes 765 rose-bushes in July. Mr Greg prunes 648 rose-bushes in the same month. In the first week of the next month Mr Gouws prunes another 165 bushes, while Mr Greg prunes another 261 bushes. Then in the second week of August Mr Greg prunes 87 more bushes while Mr Gouws prunes 184 bushes.

- In July how many more bushes did Mr Gouws prune than Mr Greg ?
- At the end of the first week in August was Mr Greg catching up to Mr Gouws? Give reasons to support your answer.
- Altogether, who pruned the most rose-bushes?
- How many bushes did both men prune altogether?

1.4.6 Assessment

Learning outcomes(LOs)
continued on next page

LO 1
Numbers, Operations and RelationshipsThe learner will be able to recognise, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.
Assessment standards(ASs)
We know this when the learner:
1.6 solves problems in context including contexts that may be used to build awareness of other Learning Areas, as well as human rights, social, economic and environmental issues such as:1.6.1 financial (including buying and selling, and simple budgets).

Table 1.27

1.4.7 Memorandum

ACTIVITY

1. MONEY MATTERS

- 500 cent 1.2 5 000 cent 1.3 20 five-cent pieces

1.4 200 five-cent pieces1.5 2 000 five-cent pieces 1.6 10 ten-cent pieces 1.7 1 000 ten-cent pieces 1.8 2 fifty-cent pieces 1.9 20 fifty-cent pieces 1.10 40 fifty-cent pieces

2. SHOPPING FOR STATIONERY

2.1(a) R20 (b) R63 (c) R18 (d) R33 (e) R39 2.2 R173

3.1 It saves time; yes.

3.2

Notes AndCoins	R78,76	AmountsR30,45	of changeR43,62	to beR21,94	R120,13	R0,55
R100					1	
R50	1					
R20	1	1	2	1	1	
R10		1				
R5	1					
R2	1		1			
R1	1		1	1		
50c	1		1	1		1
20c	1	2		2		
10c	1		1		1	
5c		1	1	1	1	1

Table 1.28

3.3 Remember, change is rounded off *upwards*, so if the *change to be given* is R78,76, the customer is given R78,80

4. AT SCHOOL

4.1 15
5. BUDGETS
5.1 GROUP WORK – AN INVESTIGATION - own answers
5.2 (a) own answer (b) own answer (c) own answer (d) own answer

1.4.7.1 TEST YOUR PROGRESS

1. Rounding off to the nearest:

	10	100	1 000
1 387	1 390	1 400	1 000
925	930	900	1 000
4 813	4 810	4 800	5 000
6 492	6490	6 500	6 000
9 509	9 510	9 500	10 000

Table 1.29

2.1 10 400 2.2 3 900
3.1 5 000 3.2 1 000
4.1 9 661 4.2 2 824 4.3 2 898

1.4.7.1.1 5WITH CALCULATORS – WORD SUMS

5.1 17 More 5.2 Yes; 910 – 909 5.3 Mr. Gouws 5.4 2 090

1.5 Ways of counting in local languages and different cultures[5]

1.5.1 MATHEMATICS

1.5.2 Grade 4

1.5.3 WHOLE NUMBERS AND THEIR RELATIONSHIPS

1.5.4 Module 5

1.5.5 WAYS OF COUNTING IN LOCAL LANGUAGES AND DIFFERENT CULTURES

Activity:

To describe and illustrate various ways of counting in local languages and different cultures throughout history [LO 1.2]

Now you are going to explore the world of number names and symbols to see how our number system developed.

1. **NUMBER NAMES**

1.1 You have been using numbers and counting on and counting backwards. See if you can remember the names for the numbers in some of our South African languages. In the table below write the name of a local language most commonly used in your area. Now write in the words in that language for numbers 1 to 10.

[5]This content is available online at <http://cnx.org/content/m30498/1.1/>.

Numbers	English	....	Afrikaans
1	One		Een
2	Two		Twee
3	Three		Drie
4	Four		Vier
5	Five		Vyf
6	Six		Ses
7	Seven		Sewe
8	Eight		Ag
9	Nine		Nege
10	Ten		Tien

Table 1.30

1.2 **GROUP WORK**

When children learn to count, they chant the numbers and move rhythmically to the music. Get together with some friends and make up a rap song to count from 11 to 20 in any South African language. Present this song to the rest of the learners.

1.3 Now write number names of another local language most used in your area. Also write the name of the language in the space provided in the second column.

Numbers	Other local language	Numbers	Other local language
11		16	
12		17	
13		18	
14		19	
15		20	

Table 1.31

1.4 Try to find out the names for the following numbers and write them in the correct columns:

Numbers	Other local language	English	Afrikaans
100			
1 000			
10 000			

Table 1.32

CHECKLIST: Number names

	Yes	No
1.1 I have written in number names for 1 to 10 in a local language that is used most in my area.		
1.2 I have made up a rap song to count from 11 to 20 with my friends. We performed it for the rest of the learners.		
1.3 I have written in number names for 11 to 20 in a local language that is used most in my area.		
1.4 I have found out and written in the names for 100; 1 000 and 10 000.		

Table 1.33

ASSIGNMENT

You may do this in your own time, at school and/or at home, as your educator decides.

NUMBER SYMBOLS: READING and RESEARCH

(Research is when you need to look up information and use it to answer questions. Ask your educator to take you to the library to do the research in this section or use the computer to look up information on the Internet.)

READ: The following information tells you about counting systems. Now test your skills by answering the questions that follow.

2. Pre-history: People in ancient times

Thousands of years ago, before people could write, they had no knowledge of numbers and figures and they had to find ways of indicating how many animals or possessions they had. They put a small pebble in a bag for every animal they possessed, or carved notches on a stick.

- Why did people start to need numbers?
- Draw a stick with notches carved on it to show that the owner possessed 5 sheep.

2.3 Besides carving notches on a stick, what else did they use to show how many animals they possessed?

Ancient civilizations

3. The Babylonians

Many years later, people used *signs or symbols* to represent numbers. The Babylonians who lived in Mesopotamia made wedge-shaped notches in wood or pressed such marks into damp clay tablets.

RESEARCH: Ask your librarian to help you to find books with pictures and information about the Babylonians and their wedge-shaped writing.

3.1 Now see if you can draw a clay tablet with the following numbers in wedged-shaped writing: 1; 5; 10; 100; 1 000. Beneath each Babylonian number, write our number. (Use your researched information to do this.)

3.2 What was this wedge-shaped writing of the Babylonians called? Ask the librarian to help you to find the name in one of the books in the library.

4. The Romans

The Romans used a system that reminds one of the habit of counting on one's fingers. One finger, for instance, represented number one. The V formed between the thumb and fingers of an open hand represented 5. To write their numbers, they used letters.

4.1 See if you can fill in the missing explanations of some Roman numbers:

Roman numbers	Explanation	Our numbers
I		1
II		2
III		3
IV	One less than five	4
V	Shape made between thumb and fingers of open hand	5
VI	One more than five	6
VII	Two more than five	7
VIII	Three more than five	8
IX	One less than ten	9
X	Crossed hands or arms	10

Table 1.34

The Romans made great use of “more than” and “less than”.
4.2 See if you can complete the following by using the previous table:

Roman numbers	Explanation	Our numbers
	One more than ten	11
	Two more than ten	12
	Three more than ten	13
	One less than fifteen	14
	Ten and five	15
	One more than fifteen	16
	Two more than fifteen	17
	Ten and eight	18
	One less than twenty	19
	Double ten	20

Table 1.35

Certain letters represented larger numbers:

50	60	90	100	500	1 000
L	LX	XC	C	D	M

Table 1.36

4.3 What number did the Roman “**C**” represent?

(Note: In measurement 100 cm = 1metre)		

Table 1.37

4.4 What number did the Roman "**M**" represent?

(Note: In measurement 1 000 mm = 1 metre)		

Table 1.38

5. The Ancient Egyptians

The Egyptians used a system of picture writing or pictography. The Egyptians' picture numbers looked like this:

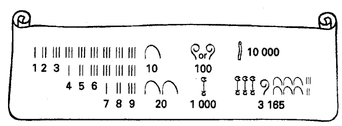

Figure 1.19

5.1 Study it carefully. The Romans used V and X a great deal. What number did the Egyptians use to write many of their numbers?

- How did the Egyptians write 88? (Use the pictures above.)
- Now try to write 10 257 as the Egyptians would write it. (Maybe our number system is not so bad after all!)

Our numbers do not look at all like those of the Babylonians or the Romans or the Ancient Egyptians, so from whom did we get our numbers?

6. The Hindu-Arabic symbols

At one stage they looked like this:

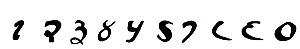

Figure 1.20

We obtained our 1; 2; 3; 4; 5; 6; 7; 8; 9 from the Arabs. Our "0" came from the Hindu people in India, via the Arabs, who adopted it. How would we cope without the "0"! Imagine trying to write two thousand and ten in numbers without any "0s".

MENTAL CALCULATIONS TEST 1

Do you know these number combinations smaller than 20?

1	9 [U+F02B] 3 =…………………………………………	11	7 - 4 =……………………………………………
2	7 [U+F02B] 5 =	12	8 - 3 =
3	8 [U+F02B] 7 =	13	11 - 5 =
4	0 [U+F02B] 5 =	14	17 - 8 =
5	7 [U+F02B] 9 =	15	1 - 0 =
6	6 [U+F02B] 8 =	16	13 - 8 =
7	4 [U+F02B] 8 =	17	14 - 9 =
8	6 [U+F02B] 5 =	18	17 - 9 =
9	6 [U+F02B] 7 =	19	13 - 4 =
10	4 [U+F02B] 7 =	20	16 - 7 =

Table 1.39

MENTAL CALCULATIONS TEST 2
Revise combinations with larger numbers:

1	48+ 9 =……………………………………….	11	37 - 4 =………………………………………
2	68 + 7 =	12	1 001- 3 =
3	87 + 9 =	13	43 - 5 =
4	55 + 9 =	14	66 - 8 =
5	90 + 90 =	15	1 - 0 =
6	50 + 60 =	16	83 - 8 =
7	80 + 50 =	17	35 - 9 =
8	17 + 8 + 6 =	18	170 - 90 =
9	54 + 8 + 7 =	19	130 - 40 =
10	94 + 4 + 7 =	20	160 - 70 =

Table 1.40

MENTAL CALCULATIONS TEST 3
Replace * with the correct relationship sign: =; [U+F03E]; <

1	9 + 6 * 7+ 8………………………………	11	9 – 5 * 4 + 0………………………………….
2	2 + 9 * 6 + 6	12	6 + 7 * 9 + 4
3	13 – 9 * 11 – 8	13	11 – 7 * 14 – 8
4	15 – 7 * 13 – 5	14	12 – 8 * 4 + 2
5	5 + 8 * 6 + 7	15	9 + 5 * 6 + 8
6	13 – 6 * 11 – 4	16	6 + 9 * 7 + 7
7	2 – 0 * 2 + 3	17	15 – 6 * 17 – 9
8	9 + 7 * 8 + 7	18	7 + 8 * 8 + 6
9	17 – 8 * 15 – 7	19	6 + 14 * 36 – 16
10	1 – 0 * 1 + 0	20	15 – 6 * 34 – 25

Table 1.41

MENTAL CALCULATIONS TEST 4.
1. Write down the missing numbers:
1.1 468 = …….. hundreds + …… tens + ……. units
1.2 2 350 = ….. thousands + …… hundreds +……… tens + 0 ………
1.3 8 642 = …… thousands + …….hundreds + …….tens + …..units

- 7 thousands + 9 hundreds + 6 tens + 1 unit = ……………………………
- 1 ten thousand = ……………………………………

2. Write down the number that is:
2.1 one more than 999 ………………
2.2 five less than 101 ……………..
2.3. between 48 and 50 ……………..

- greater than one thousand and less than one thousand and two
- ten fewer than 9 000

3. Write down the missing numbers:

- If 7 + 8 = 15, then 17 + 8 = ……… and 70 + 80 = ……………..
- If 6 + 7 = 13, then 16 + 7 = ……… and 16 + 13 = ………..
- If 14 – 6 = 8, then 140 – 60 = ………. and 16 + 8 = ……….

4. Encircle the largest number: 1 010; 1 001; 1 100
5. What number is 99 more than 9 901? ………………
6. What is the value of the 3 in the number 3 456?……………..
7. What number is 2 less than 1 001?………………………..

1.5.6 Assessment

Learning outcomes(LOs)
LO 1
Numbers, Operations and RelationshipsThe learner will be able to recognise, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.
Assessment standards(ASs)
We know this when the learner:
1.1 count forwards and backwards in a variety of intervals (including 2s; 3s; 5s; 10s; 25s; 50s and 100s) between 0 and 10 000;
1.2 describes and illustrates various ways of counting in different cultures (including local) throughout history;

Table 1.42

1.5.7 Memorandum

ACTIVITY – WAYS OF COUNTING

1. NUMBER NAMES

- ICS to supply numbers 1 to 10 inclusive in eleven official languages.
- Oral group work
- ICS to provide numbers 11 to 20 inclusive in eleven official languages.
- ICS to provide numbers: 100; 1 000 and 10 000 in eleven official languages.

1.5.7.1 ASSIGNMENT

2.1 They had to count their animals and possessions.
2.2 Drawing
2.3 They put a stone in a bag for each animal or possession.
3. Babylonians
3.1 Drawing
3.2 cuneiform writing
4.1 one; double one; three
4.2 XI; XII; XIII; XIV; XV; XVI; XVII; XVIII; XIX; XX
4.3 100
4.4 1 000
5. The Ancient Egyptians
5.1 I
5.2 see diagram
5.3 see diagram
6 The Hindu-Arabic symbols
Discussion

Chapter 2

Term 2

2.1 Numeric patterns[1]

2.1.1 MATHEMATICS

2.1.2 Grade 4

2.1.3 NUMBERS, FEACTIONS, DECIMALS AND NUMBER PATTERNS

2.1.4 Module 6

2.1.5 NUMERIC PATTERNS

Activity 1:

To recognise and represent multiples in order to be able to describe, compare and represent them [LO 1.3]
To investigate numeric patterns [LO 2.1]
To describe numeric patterns in your own words [LO 2.2]
To find output numbers [LO 2.3]

Table 2.1

1. When we count in 6's we are saying the **multiples of 6.**

1.1 Work with a friend. One of you must count in 6's from 0 to 102. The other one must use a calculator to check you and stop you if you make a mistake. If that happens the one with the calculator must just say, "Stop!" and show the calculator. The counting goes on from there. Then swap over.

1.2 Now fill in the missing multiples of 6 in the table below:

	1	2	3	4	5	6	7	8	9	10	11	12
$\times$ 6	6	12	18	24	30					60	66	

Table 2.2

[1]This content is available online at <http://cnx.org/content/m30499/1.1/>.

1.3 Now count backwards in 6's from 102 to 0. Let a friend check you. Then swap over. Do you notice anything? Yes, multiples of 6 are all even numbers.

1.4 What patterns do you notice? Yes, the last digits seem to be 6;..2; ..8; ..4; ..0. They are repeated and so form a pattern.

Now that you are aware of this, you can count in 6's for ever (if you concentrate)!

1.5 Count in 6's and complete the flow diagram:

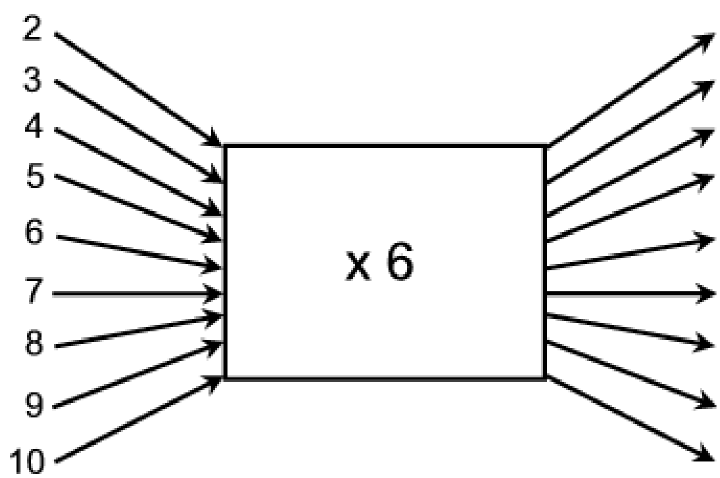

Figure 2.1

1.6 How do we programme the calculator to count in 6's?

Press clear and

1.7 Write down the multiples of 6 from 102 to 0:

1.8 How do we programme the calculator to count backwards in 6's from 102?

Press clear and

Now you can really count in 6's easily, so let's move on to 7's.

2. **Multiples of 7**

2.1 Now use your calculator (if necessary) to count in 7's and complete the flow diagram:

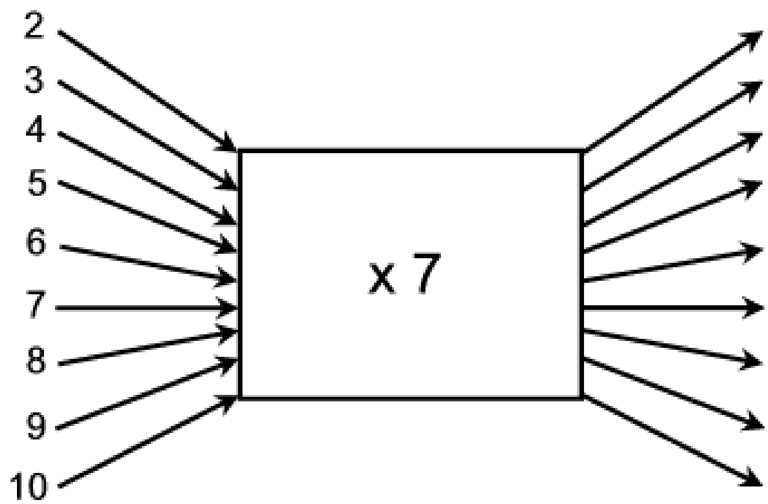

Figure 2.2

Can you spot any patterns? Two are written below. Try to spot some more and discuss with a friend.

- They are both odd and even numbers.
- They seem to be: odd, even, odd, even.

2.2 Now fill in the missing multiples of 7:

	1	2	3	4	5	6	7	8	9	10	11	12
$\times$ 7	7	14	21							70	77	

Table 2.3

There seems to be some sort of repetition after the first 9 multiples. Does it continue?
Are there any other patterns? Write down what you have noticed.

- Count backwards in 7's from 105 to 0. Use your calculator to do this if necessary.
- Write the missing multiples of 6 in the table below and then the multiples of 7 in the next row. Do you notice anything?

	1	2	3	4	5	6	7	8	9	10	11	12
$\times$ 6	6	12	18	24								
$\times$ 7	7	14	21	28								

Table 2.4

2.5 Now compare the two rows (across) of answers. A very interesting pattern appears to be emerging.
Look: $1 \times 7 = 1\times 6 + 1$
$5 \times 7 = 5 \times 6 + \ldots\ldots$
$9 \times 7 = 9 \times 6 + \ldots\ldots$

$2 \times 7 = 2 \times 6 + \ldots\ldots$
$6 \times 7 = 6 \times 6 + \ldots\ldots$
$10 \times 7 = 10 \times 6 + \ldots\ldots$

1. $\times\ 7 = 3 \times 6 + \ldots\ldots$
2. $7 \times 7 = 7 \times 6 + \ldots\ldots$
3. $11 \times 7 = 11 \times 6 + \ldots\ldots$

$4 \times 7 = 4 \times 6 + \ldots\ldots$
$8 \times 7 = 8 \times 6 + \ldots\ldots$
$12 \times 7 = 12 \times 6 + \ldots\ldots$

3. **Multiples of 8**

3.1 The numbers jump in 8 wholes. Use the calculator to count in 8's and write down the missing multiples of 8.

0, 8, 16, 24, 32,……., ……., …………., ………., ……………,…………….,…………., …………….., ………, ……..., …………., ………….

3.2 Another way of saying: 8 + 8 + 8 + 8 is 4 × 8.

Now complete the flow diagram:

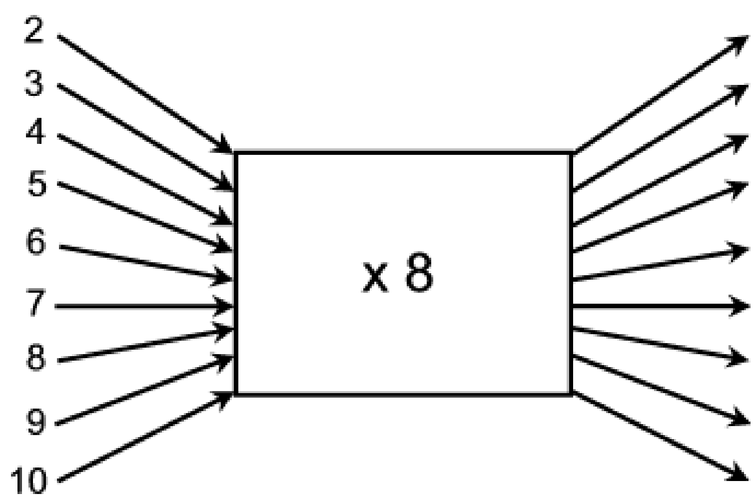

Figure 2.3

3.3 Spot a pattern. Write down the missing multiples of 8 in the table below and look at the last digit of each one.

	1	2	3	4	5	6	7	8	9	10	11	12
× 8	8	16								80	88	

Table 2.5

Look carefully:

8; 16; 24; 32; 40; 48; 56; 64; 72; 80; 88; 96

If you are aware of the pattern in which 8; ..6; ..4; ..2; ..0; is repeated, and concentrate, you should be able to count in 8's forever, without mistakes.

- Now, work with a friend. Count in 8's from 0 to 104 while your friend checks you on a calculator. Then swap over.

3.5 Now count backwards in 8's from 104 to 0 while your friend checks you on a calculator.
Then swap over.

4. **Multiples of 9**

Figure 2.4

4.1 Do what Sue suggested. Write down the missing multiples of 9 in the flow diagram and look at the last digit of each one. Spot the pattern.

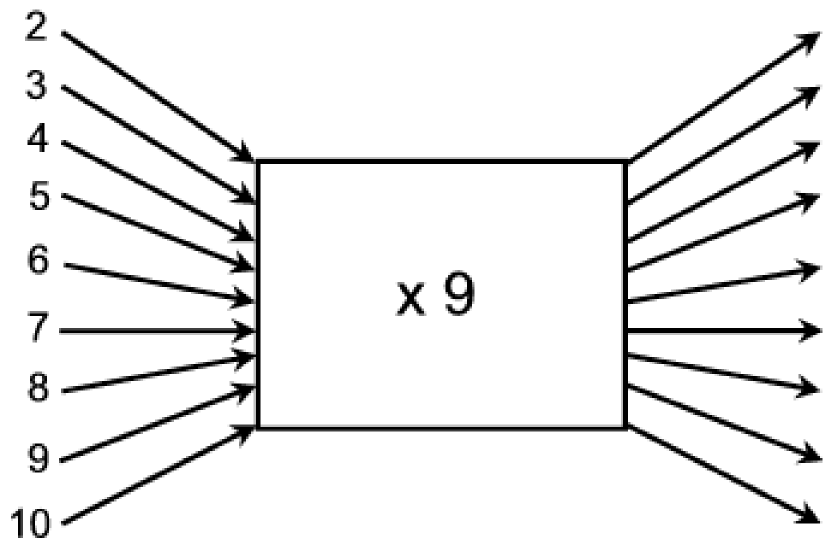

Figure 2.5

4.2 Counting in 9's is the easiest of all! Now complete the table below.

	1	2	3	4	5	6	7	8	9	10	11	12
$\times$ 9	9	18	27							90	99	

Table 2.6

4.3 Now count backwards in 9's while a friend checks you on the calculator. Begin with 108.

Now you should feel comfortable when you count in 6's; 7's; 8's and 9's and you already know how to count in tens. Practise this with a friend, forwards and backwards.

TEST YOUR SKILLS

1. Complete the following by doing one column each day or all four columns in one day, or two columns per day, as your educator chooses:

(a) $7 \times 4 =$…………	$6 \times 8 =$………………	$8 \times 9 =$………………	$2 \times 8 =$………………
(b) $9 \times 8 =$	$3 \times 7 =$	$1 \times 7 =$	$6 \times 9 =$
(c) $7 \times 6 =$	$8 \times 7 =$	$6 \times 5 =$	$8 \times 7 =$
(d) $2 \times 5 =$	$3 \times 9 =$	$7 \times 9 =$	$5 \times 5 =$
(e) $10 \times 10 =$	$2 \times 8 =$	$9 \times 9 =$	$4 \times 6 =$
(f) $3 \times 6 =$	$8 \times 5 =$	$9 \times 0 =$	$9 \times 8 =$
(g) $4 \times 2 =$	$5 \times 8 =$	$7 \times 3 =$	$7 \times 10 =$
(h) $5 \times 6 =$	$6 \times 6 =$	$8 \times 8 =$	$3 \times 8 =$
(j) $4 \times 4 =$	$0 \times 10 =$	$4 \times 9 =$	$5 \times 7 =$
(k) $5 \times 9 =$	$4 \times 8 =$	$5 \times 7 =$	$4 \times 7 =$
TOTAL:	TOTAL:	TOTAL:	TOTAL:

Table 2.7

2. Now write all those that you got wrong and write down a way of finding the correct answer for each of them.

Activity 2:

To do mental calculations involving multiplication of whole numbers [LO 1.9]

1. Now complete this flow diagram:

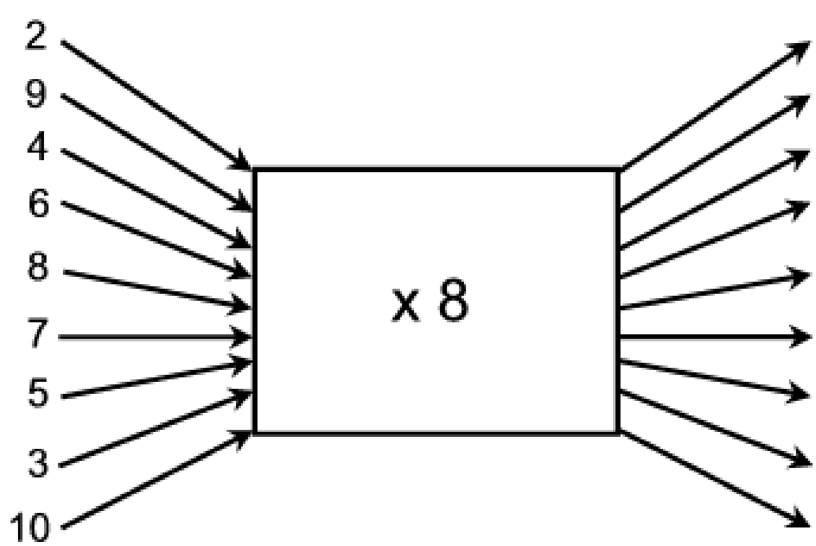

Figure 2.6

2. Ways of solving 7 x 8.

Example of solving 7 x 8.

- 7 x 4 + 7 x 4 OR double (7 x 4)

- 8 + 8 + 8 + 8 + 8 + 8 + 8
- Counting in 8's till you reach 7 x 8
- 7 x 5 + 7 x 3 i.e. breaking up the 8 as we did previously
- 2 x 8 + 5 x 8 i.e. breaking up the 7 to make it easier; I know 2 x 8 and 5 x 8
- Double 3 x 8 + 8
- 7 x 10 - 2 x 7Be sure that you know what you are doing!

3. Now take each one that bothers you, and find a way of reaching the answer **without a calculator** and write your solution in the table below.

My way of solving each problem:

e.g. 8×8	Double $4 \times 8 = 32 + 32 = 64$
3×6	6×3 (I know my 3 times table) $= 18$

Table 2.8

TEST YOUR SKILLS

- Complete each of the following:

1.

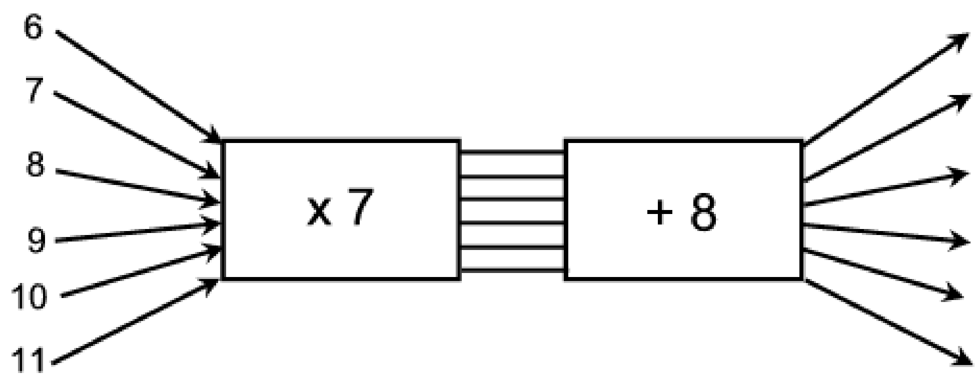

Figure 2.7

2.

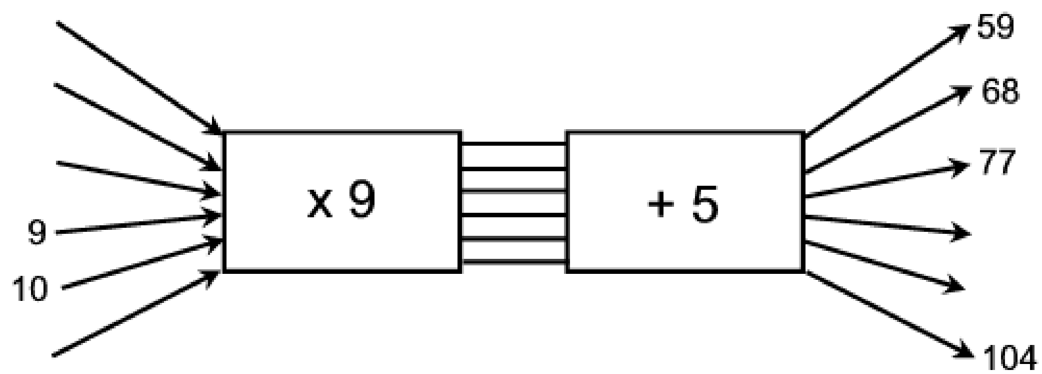

Figure 2.8

3.

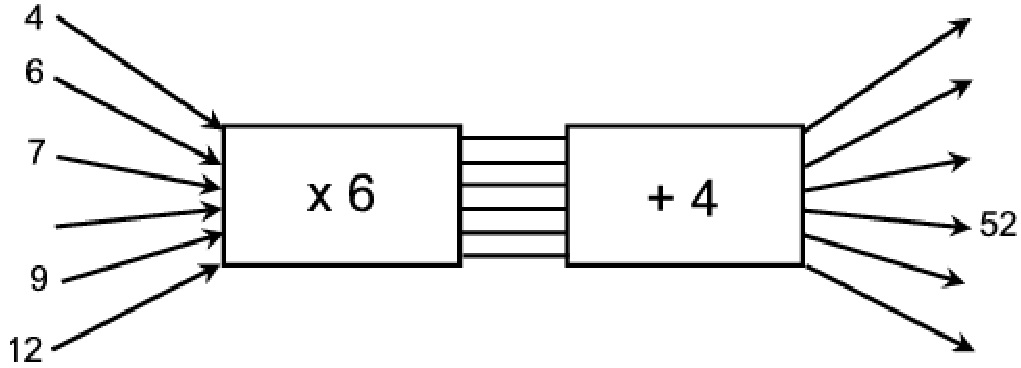

Figure 2.9

4.

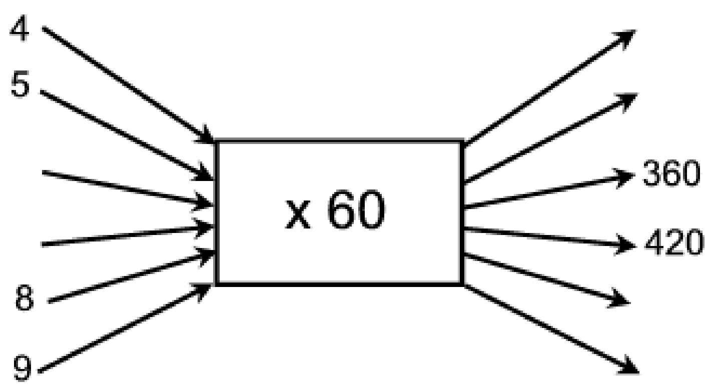

Figure 2.10

5.

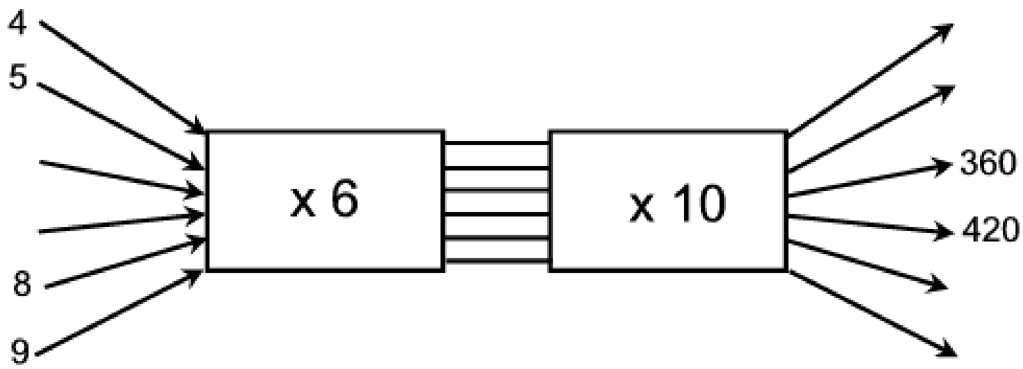

Figure 2.11

6. Explain the link between 4 and 5.
7. Use what you have learnt in 4 and 5 to complete the following:

(a) 6 × 20 =	(f) 40 × 20 =
(b) 7 × 70 =	(g) 60 × 60 =
(c) 50 × 3 =	(h) 50 × 80 =
(d) 9 × 70 =	(j) 60 × 7 =
(e) 8 × 30 =	(k) 90 × 50 =

Table 2.9

Activity 3:

To estimate and calculate by selecting and using a range of techniques [LO 1.1, 1.8]

1. You have found ways of calculating answers of tables that you have not memorized. Now estimate the answer by rounding off. Estimations should be quick and easy, but they only give approximate answers. Then find ways of reaching the exact answer of the following sums and write down all your steps:

1.1 7 x 18

- 24 x 6

Discuss your methods with other friends in your group.

1.3 36 x 54

Examples of methods:

- 7 × 18

Estimation: 7 × 20 = 140; the answer is about 140

7 × 10 + 7 × 8 i.e. 7 times all of 18

Other ways of finding the exact answer:

or: 18 + 18 + 18 + 18 + 18 +18 + 18

or: 7 × 20 - 14

There are other methods. Try to think of them.

- 64×35

i.e. all of $64 \times$ all of 35

Estimation: $60 \times 40 =$2 400

$60 \times 30 = 1\ 800$

$60 \times 5 = 300$ i.e. add all answers

$4 \times 30 = 120$

$4 \times 5 = \underline{20}$

2 240

When you are really comfortable with this method, you can proceed to the old traditional vertical method. Don't try to get there too quickly; more haste, less speed.

2. Word sums.

2.1 Share 54 Smarties equally amongst 9 friends. What does each one receive?

2.2 54 learners have to be transported to an Athletics Meeting. The coach wants to hire vehicles that may take 8 passengers. How many vehicles will be needed?

2.3 A shopkeeper has 106 apples. He puts them on little trays to sell them in his shop. There are 6 apples on each tray. How many trays can he fill?

Some methods:

- $9 + 9 + 9 + 9 + 9 + 9$ (How many 9's in 54?)

or: 54 [U+F0B8] 9

$9 \times ? = 54$

There are other methods

- 54 [U+F0B8] 8

$6 \times 8 = 48$; 6 rem. 6, but they are people who have to get to the athletics meeting.

$7 \times 8 = 56$

7 vehicles will be needed and there will be 2 empty seats on one of them.

- 106 [U+F0B8] 6

$10 \times 6 = 60$

$5 \times 6 = 30$

$2 \times 6 = \underline{12}$

102

17 trays rem. 4 apples (The key word here is "fill".)

There are other ways. Discuss them with your friends and find the way that you understand best.

3. Calculate the answer. Write down the steps of your calculations, explaining (in numbers) how you reached your solution. Then write down the steps which you used to check that your answer is reasonable.

3.1 The mass of a van after it has been loaded is 2 500 kg. If the mass of the load is 500 kg, what is the mass of the van when it is empty?

3.2 The mass of one bag of cement is 25 kg. How many bags of cement will there be if the mass of the whole load is 500 kg?

3.3 The petrol tank of the van can hold 55 litres of petrol when it is full. The van needs one litre of petrol to travel 13 km. The driver fills his tank with petrol. How far can he travel before he needs to fill his tank again?

3.4 When the van is used for short trips around the town, it only travels 11 km per litre of petrol. The driver fills his petrol tank, which holds 55 litres of petrol. How many kilometres can it travel in the town?

3.5 Your school soccer team has to travel from Cape Town to Grahamstown to take part in a soccer tournament. Your team can go by bus along the coast, a distance of 899 km, or you can go by train via De Aar. The distance between Cape Town and De Aar is 762 km. From De Aar to Grahamstown is 444 km.

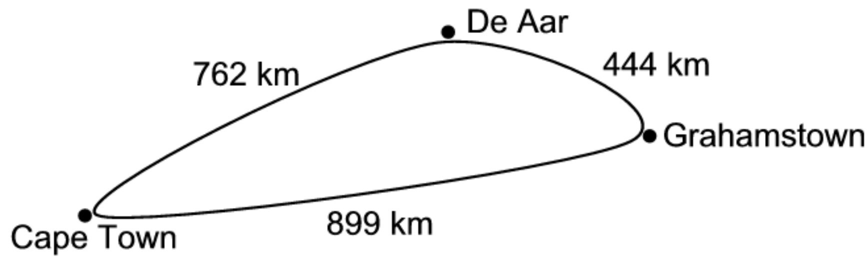

Figure 2.12

How much further will you travel if you go by train?

3.6 A special tour to the Kruger National Park is arranged for 134 tourists from overseas. At the rest camp 8 people can sleep in a rondavel. How many rondavels are needed for the tourists?

3.7 There is a tourist shop at the rest camp in the Kruger Park. In this shop special torches called Bush Baby Lanterns are sold. Seven tourists buy a torch each and together they pay R273 for them. How much does one Bush Baby Lantern cost?

3.8 On one side of the car park at the rest camp there is a straight fence consisting of wooden poles. The upright poles for this fence are 3 m apart. There are 18 upright poles. How long is the fence? (To understand the story, draw a fence with 6 poles – technique: substituting smaller numbers in order to understand the story.)

2.1.6 Assessment

Learning outcomes(LOs)
LO 1
Numbers, Operations and RelationshipsThe learner will be able to recognise, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.
Assessment standards(ASs)
We know this when the learner:
1.1 counts forwards and backwards in a variety of intervals;
1.3 recognises and represents the following numbers in order to describe and compare them: common fractions with different denominators, common fractions in diagrammatic form, decimal fractions and multiples of single-digit numbers;
continued on next page

1.3.2 common fractions with different denominators, including halves, thirds, quarters, fifths, sixths, sevenths and eighths;
1.3.3 common fractions in diagrammatic form;
1.3.4 decimal fractions of the form 0,5; 1,5 and 2,5; etc., in the context of measurement;
1.3.6 multiples of single-digit numbers to at least 100;
1.5 recognises and uses equivalent forms of the numbers including common fractions and decimal fractions;
1.5.1 common fractions with denominators that are multiples of each other;
1.5.2 decimal fractions of the form 0,5; 1,5 and 2,5, etc., in the context of measurement;
1.7 solves problems that involve comparing two quantities of different kinds (rate);
1.7.1 comparing two or more quantities of the same kind (ratio);
1.8 estimates and calculates by selecting and using operations appropriate to solving problems that involve addition of common fractions, multiplication of at least whole 2-digit by 2-digit numbers, division of at least whole 3-digit by 1-digit numbers and equal sharing with remainders;
1.8.3 addition of common fractions in context;
1.8.6 equal sharing with remainders;
1.9 performs mental calculations involving:
1.9.2 multiplication of whole numbers to at least 10 x 10;
1.12 recognises, describes and uses:, and
1.12.1 the reciprocal relationship between multiplication and division (e.g. if 5 x 3 = 15 then $15 \div 3 = 5$ and $15 \div 5 = 3$;
1.12.2 the equivalence of division and fractions (e.g. $1 \div 8 = 1/8$);
1.12.3 the commutative, associative and distributive properties with whole numbers.
Learning outcomes(LOs)
LO 2
Patterns, Functions and AlgebraThe learner will be able to recognise, describe and represent patterns and relationships, as well as to solve problems using algebraic language and skills.
Assessment standards(ASs)
We know this when the learner:
continued on next page

2.1 investigates and extends numeric and geometric patterns looking for a relationship or rules;
2.1.1 represented in physical or diagrammatic form;
2.1.2 not limited to sequences involving constant difference or ratio;
2.1.3 found in natural and cultural contexts;
2.1.4 of the learner's own creation;
2.2 describes observed relationships or rules in own words;
2.3 determines output values for given input values using verbal descriptions and flow diagrams;
2.3.1 verbal descriptions;
2.3.2 flow diagrams.

Table 2.10

2.1.7 Memorandum

ACTIVITY 1

2.1.7.1 MULTIPLES; NUMBER PATTERNS; FLOW DIAGRAMS

1. Multiples of 6

- Oral
- Missing multiples of 6

	1	2	3	4	5	6	7	8	9	10	11	12
x 6						36	42	48	54			72

Table 2.11

- Oral
- Own answers e.g. they're all even numbers; they're all also multiples of 3; some are multiples of 9; some are multiples of 12; they are no prime numbers etc.
- Flow diagram: Output numbers are: 12; 18; 24; 30; 36; 42; 48; 54; 60
- Using the calculator to count in 6's: press clear; 6 + = = = or 6 + + = = =
- 6; 12; 18; 24; 30; 36; 42; 48; 54; 60; 66; 72; 78; 84; 90; 96; 102
- clear; 102 – 6 = = = or clear; 6 - - 102 = = =

2. Multiples of 7
   2.1 Flow diagram – output numbers: 14; 21; 28; 35; 42; 49; 56; 63; 70

- Missing multiples of 7

	1	2	3	4	5	6	7	8	9	10	11	12
x 7				28	35	42	49	56	63			84

Table 2.12

- Yes
- Own ideas

2.3 105; 98; 91; 84; 77; 70; 63; 56; 49; 42; 35; 28; 21; 14; 7; 0
2.4 Missing multiples of 6 and of 7

	1	2	3	4	5	6	7	8	9	10	11	12
x 6					30	36	42	48	54	60	66	72
x 7					35	42	49	56	63	70	77	84

Table 2.13

2.5 The difference between the multiples of 6 and of 7: 1; 2; 3; . . .
i.e. 1 x 6 = *6* ; 1 x 7 = *7* the difference between the *answers* is 1;
2 x 6 = *12* ; 2 x 7 = *14* the difference between the *answers* is 2;
3 x 6 = *18 ;* 3 x 7 = *21* the difference between the *answers* is 3, etc.
Missing numbers:
1; 5 ; 9
2; 6; 10
3; 7; 11
4; 8; 12

1. Multiples of 8 missing numbers:

32, 40, 48, 56, 64, 72, 80, 88, 96, 104, 112, 120
3.2 Flow diagram: missing output numbers: 16; 24; 32; 40; 48; 56; 64; 72; 80
3.3 Missing multiples of 8:

	1	2	3	4	5	6	7	8	9	10	11	12
x 8			24	32	40	48	56	64	72			96

Table 2.14

3.4 Oral
3.5 Oral
4. Multiples of 9
4.1 Flow diagram – missing output numbers: 18; 27; 36; 45; 54; 63; 72; 81; 90

- Missing multiples of 9

	1	2	3	4	5	6	7	8	9	10	11	12
x 9				36	45	54	63	72	81			108

Table 2.15

- Oral

2.1.7.1.1 For Fun – oral

2.1.7.1.2 Test your skills

1. (a) 28, 48, 72, 16
(b) 72, 21, 7, 54
(c) 42, 56, 30, 56
(d) 10, 27, 63, 25
(e) 100, 16, 81, 24
(f) 18, 40, 0, 72
(g) 8, 40, 21, 70
(h) 30, 36, 64, 24
(j) 16, 0, 36, 35
(k) 45, 32, 35, 28
2. Own
ACTIVITY 2
1. Flow diagram – multiples of 8, mixed up
Missing output numbers: 16; 72; 32; 48; 64; 56; 40; 24; 80
2. Own
3. Own
4. Own methods of solving multiplication of single digit x single digit.

2.1.7.2 TEST YOUR SKILLS

1. Flow diagram – missing output numbers: 50; 57; 64; 71; 78; 85
2. Flow diagram – missing output numbers: 6; 7; 8; ...;11
– missing output numbers: ...; 86; 95
3. Flow diagram – missing output numbers: ...; 8
– missing output numbers: 28; 40; 46; ...; 58; 76
4. Flow diagram – missing output numbers: ...; 6; 7

- missing output numbers: 240; 300; ...; 480; 540

5. Flow diagram – missing output numbers: ...; 6; 7
missing output numbers: 240; 300; ...; 480; 540
6. x 60 $\approx$ x 6 x 10
7. Missing answers
(a) 120 (b) 490 (c) 150 (d) 630 (e) 240
(f) 800 (g) 3 600 (h) 4 000 (j) 420 (k) 4 500
ACTIVITY 3 – estimations and calculations
1.1 126; 7 x 20 = 140 or 10 x 18 = 180
1.2 144 20 x 6 = 120 or 24 x 10 = 240 or 20 x 10 = 200
1.3 1 944 40 x 50 = 2 000
2. Word sums
2.1 6 Smarties
2.2 7 vehicles
2.3 17 trays and 4 apples left over
3.
3.1 2 000 kg: 2 000 + 500
3.2 20 bags: 25 x 20 = 500
3.3 715 km: rounding off: 60 x 10 = 600 (various methods of checking)
3.4 605 km; rounding off: 60 x 10 = 600
3.5 307 km 899 km + 307 km = 762 km + 444 km

3.6 17 rondavels; 17 x 8 = 80 + 56 = 136
3.7 R39: 39 x 7 = 210 + 63 = 273
3.8 I – I – I – I – I – I – I : 51 m

2.2 Common fractions with different denominators and numerators[2]

2.2.1 MATHEMATICS

2.2.2 Grade 4

2.2.3 NUMBERS, FEACTIONS, DECIMALS AND NUMBER PATTERNS

2.2.4 Module 7

2.2.5 COMMON FRACTIONS WITH DIFFERENT DENOMINATORS AND NUMERATORS

Activity 1:

To recognise common fractions with different denominators and numerators [LO 1.3]

When we break whole things into equal parts, we obtain fractions. Fractions are parts of wholes.

1. Read the following and fill in any missing number of parts:

Number of equal parts into which the whole is broken	Name of fraction
2 equal parts	Halves
…….equal parts	Thirds
4 equal parts	Quarters
5 equal parts	Fifths
…….equal parts	Sixths
7 equal parts	Sevenths
8 equal parts	Eighths
9 equal parts	Ninths
…….equal parts	Tenths

Table 2.16

2. Name the parts or COMMON FRACTIONS into which each bar has been divided:

Example:

Table 2.17

It has been divided into quarters.

2.1

[2]This content is available online at <http://cnx.org/content/m30502/1.1/>.

Table 2.18

It has been divided into
2.2

Table 2.19

It has been divided into
2.3

Table 2.20

It has been divided into
2.4

Table 2.21

It has been divided into
2.5

Table 2.22

It has been divided into
2.6

Table 2.23

It has been divided into
TEST YOUR SKILL (Exercises 1 and 2 above)
1.
1.1 Divide the circle into two halves:

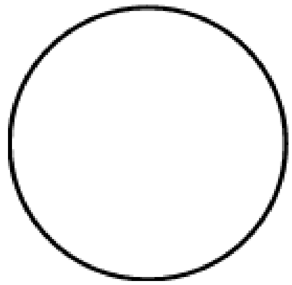

Figure 2.13

1.2 Divide it into halves another way:

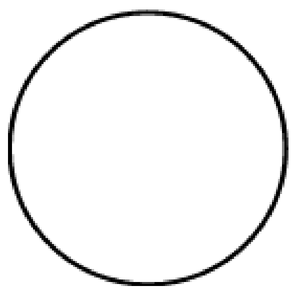

Figure 2.14

1.3 In how many different ways can a circle be divided in half?
2.
2.1 Divide the rectangle into 3 thirds

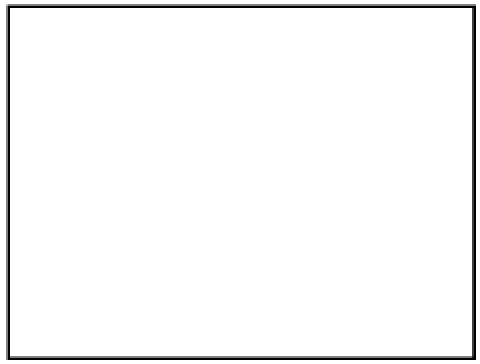

Figure 2.15

2.2 Divide it into thirds another way:

Figure 2.16

2.3 How many equal parts are there if something has been divided into thirds?
3. How many equal parts are there in each of the following diagrams and what are the parts called?

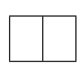

Table 2.24

3.1 parts; called

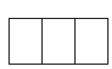

Table 2.25

3.2 parts; called

4. Now shade in one half of 3.1 on the previous page, and one third of 3.2. Which is bigger: one half or one third?

5. Now look at the two bars below. The top bar shows because there are equal parts.

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td colspan="2"></td><td></td><td></td><td></td><td colspan="2"></td></tr>
</table>

Table 2.26

The bar below it shows because there are equal parts.

3. **HANDS ON! INDIVIDUAL WORK: RECOGNISING AND REPRESENTING NUMERATORS**

- The work on this page is for cutting out and folding. In this module you have a separate page containing shapes. Cut out all the shapes and follow the instructions below:

3.1 Cut out the triangle on your extra page. Fold it in half. Now open it out. Draw dotted lines on the fold. The dotted lines divide the triangle into two equal parts, or halves. Colour in one half. Now paste your cutout on top of the triangle printed below. Name the part that you coloured in.

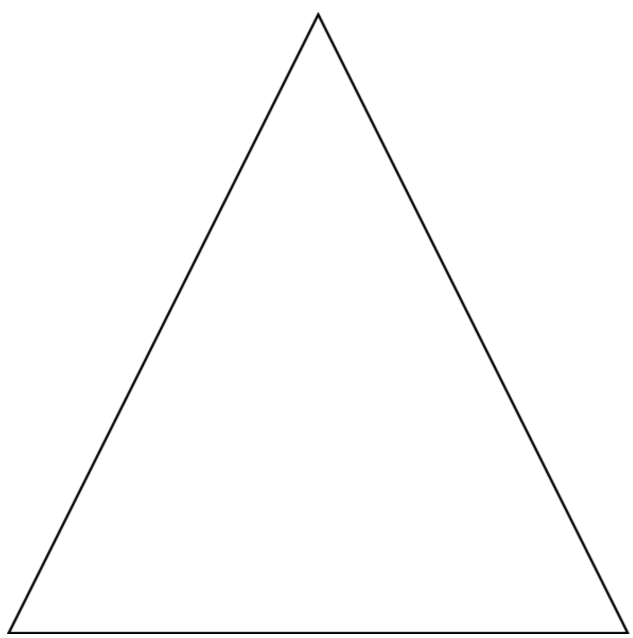

Figure 2.17

3.2 Cut out the circle on your extra copy. Fold it in half. Fold it in half again. Now open out the circle. Draw dotted lines on the folds. The dotted lines should divide the circle into four equal parts, quarters. Shade in three of them. Now paste your cutout on top of the circle printed below. Name the part that you coloured in.

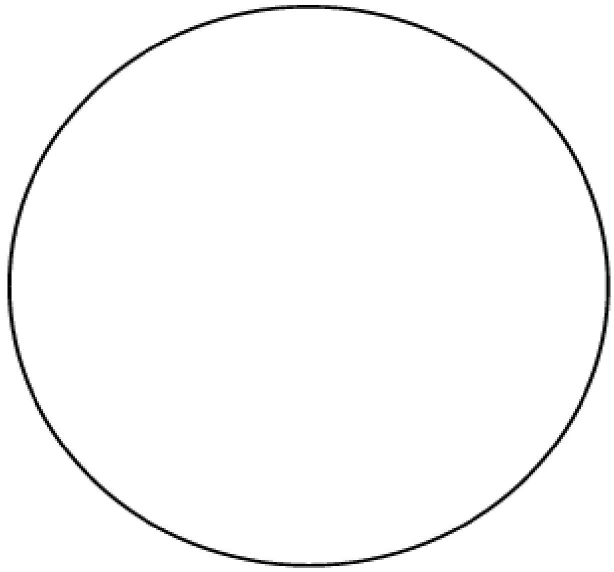

Figure 2.18

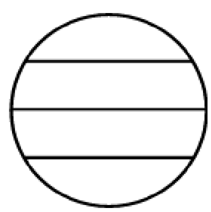

Figure 2.19

3.3 Has this circle been divided into quarters?

Your answer:

3.4 Cut out the rectangle. Fold it to make thirds. Now open it out. Draw dotted lines on the folds. The dotted lines should divide the rectangle into thirds. Shade in two of them. Do the same with the second rectangle, but try to fold it to make sixths. Also shade in two of them. Now paste your cutout on top of the rectangles printed below. Name the parts that you coloured in.

3.5 Cut out the bar. Fold it to make eighths. Now open it out. Draw dotted lines on the folds. The dotted lines should divide the bar into eight equal parts. Check that this is correct. Shade in two of them. Do the same with the second bar but fold it to make quarters. Also shade in two of them. Now paste your cutout on top of the bars printed below. Name the parts that you coloured in.

3.6 Now look at the bars, and use the signs: $<$ and [U+F03E] to complete the following on the page in your module:

a) Two-eighths ____________two quarters
b) Three-eighths ____________one-quarter
c) One-eighth ____________one-quarter
d) Five-eighths ____________three-quarters
e) Six-eighths ____________two-quarters
f) Three-eighths ____________two-quarters

SHAPES TO CUT OUT

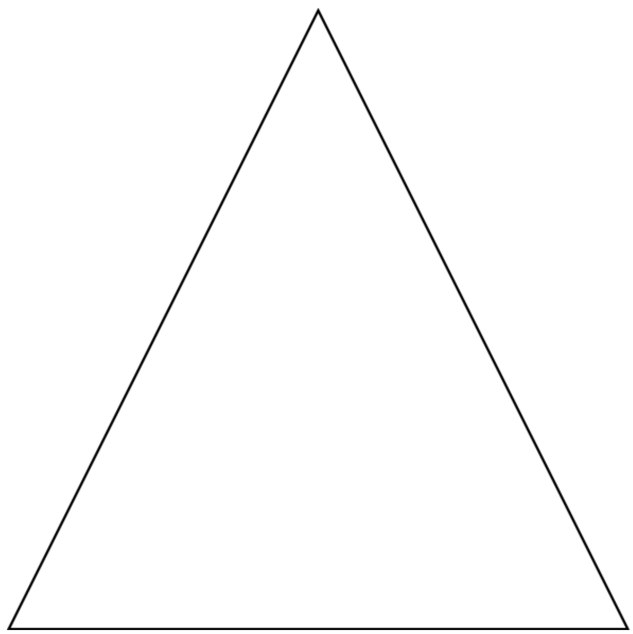

Figure 2.20

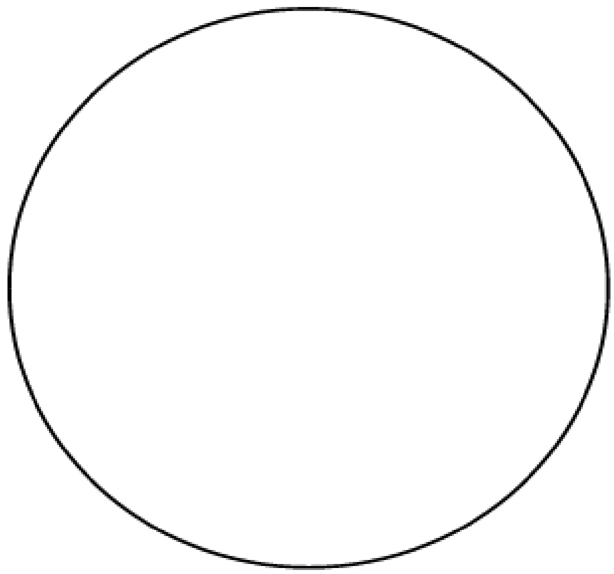

Figure 2.21

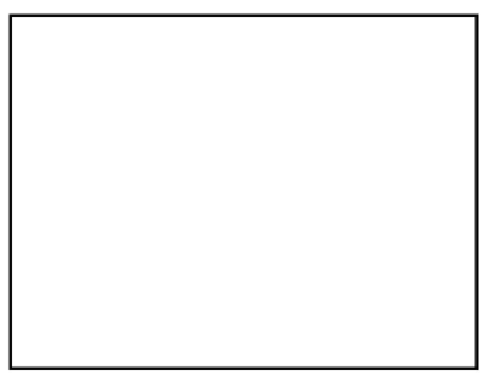

Figure 2.22

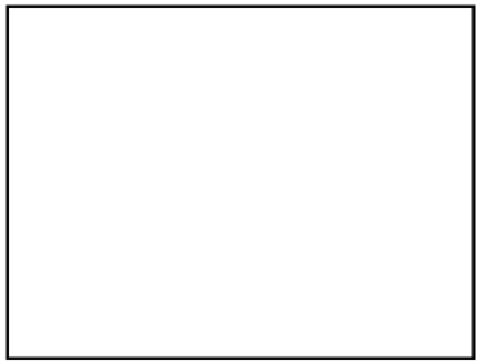

Figure 2.23

Activity 2:

To recognise and describe reciprocal relationship, equivalence of division and fractions, and the properties of whole numbers [LO 1.12]

What are fractions?

We have said fractions are equal parts of a whole. Fractions are numbers. Twenty-five is a number; half is also a number.

- 25 is not a 2 and a 5! 25 is twenty and five. Similarly we must think of a half as a number. It does not consist of a 1 and a 2; it is a half, a number.
- All the bits of $\frac{1}{2}$ form a number.
- We learnt that twenty-five could be written in words or with digits: 25.
- Fractions can also be written in words or with digits: half or $\frac{1}{2}$.

What is a half? We take a whole and divide it into two equal parts. We could take an apple and divide it equally between two girls: 1[U+F0B8]2 =half

$\frac{1}{2}$ The line in the middle could mean [U+F0B8] so 1 [U+F0B8] 2

Half or $\frac{1}{2}$ means 1 [U+F0B8] 2

- When we write fractions as numbers, the digit below tells us into how many parts the whole has been divided. The top digit tells us how many of those parts we are using.

$$\frac{1}{2} \tag{2.1}$$

How many of those parts are being used (Numerator)

How many parts the whole is divided into (Denominator)

Figure 2.24

1. Each of the following bars represents one whole.
1.1 This bar has been divided into fifths.
a) Draw coloured lines on it to show tenths:

Table 2.27

a) Shade $\frac{3}{10}$ of it.

1.2 This bar shows twelfths.
a) Draw coloured lines on it to show quarters.

Table 2.28

b) Shade $\frac{3}{4}$ of it.
1.3 This bar shows fourteenths.
a) Draw coloured lines on it to show sevenths.

Table 2.29

b) Shade $\frac{4}{7}$ of it.
Activity 3:

To solve problems involving equal sharing with remainders [LO 1.8]
To recognise and use equivalent forms of common fractions [LO 1.5]
To recognise and represent common fractions in order to describe and compare them in writing and diagram form [LO 1.3

Table 2.30

GROUP WORK

1. Read the following little story, then complete the questions and instructions about it. You may work in a group or with a friend if your educator agrees.

When the bell rang for break, Khanyi and Reyhana ran to their favourite sunny corner of the playground. They sat down and opened their lunch boxes.

“Oh my!” said Khanyi, “I've got six Marie biscuits today! I can't eat six biscuits! I tell you what, Reyhana, let's share our lunches equally.”

“That's a good idea,” said Reyhana “I've got those bits of dried fruit. You know, they mash up the dried fruit, roll it in sugar and cut it into bite size. My mother has given me nine pieces!”

Just then two of their friends ran up and asked if they might join them. “Of course!” said Reyhana. “We're going to share our lunches equally. This will be fun. What have you got?”

Jill sat down and opened her box. “I've got two of those cheeses that come in a round box,” she said. “You know, they are triangles of cheese done up in silver paper.”

Themba said, "I think my mother was in a hurry today! She cut up an apple into eight pieces and gave them to me for my lunch."

"That's good," said Khanyi, "There are four of us, so each of us can have two pieces of your apple. Now let's share my six biscuits."

Questions and instructions concerning the story.

- There were four girls. Colour in how much biscuit ONE girl received.

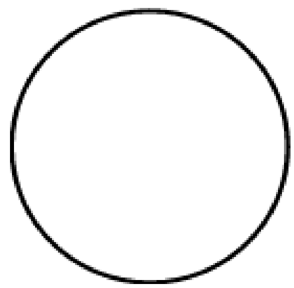

Figure 2.25

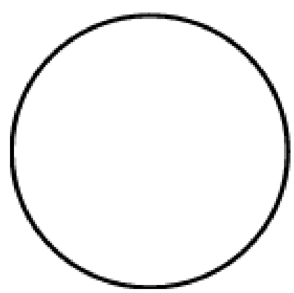

Figure 2.26

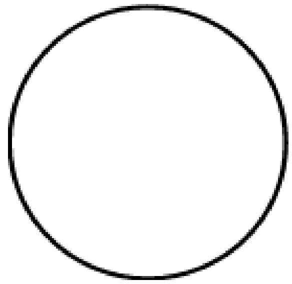

Figure 2.27

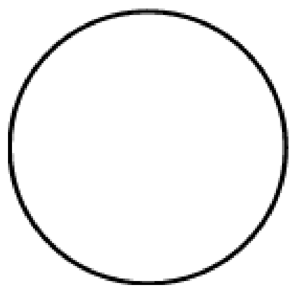

Figure 2.28

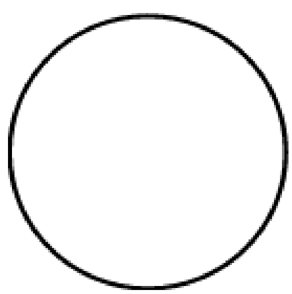

Figure 2.29

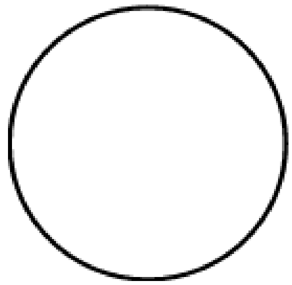

Figure 2.30

1.2 How much biscuit did each girl receive?

1.3 Khanyi said each girl could have two pieces of apple. Discuss with a friend or group: how much of the whole apple did each girl receive? Now write your answer.

1.4 There were nine pieces of sugared fruit. How many whole pieces did each girl receive?

1.5 How many pieces of dried fruit were left? Make a drawing to show how the girls would share this equally.

1.6 Altogether, how much dried fruit did each girl receive?

1.7 There were two triangular cheeses and four girls. Discuss with a friend or group how the girls would share these equally and draw in dotted lines on the diagrams below to show how they did it.

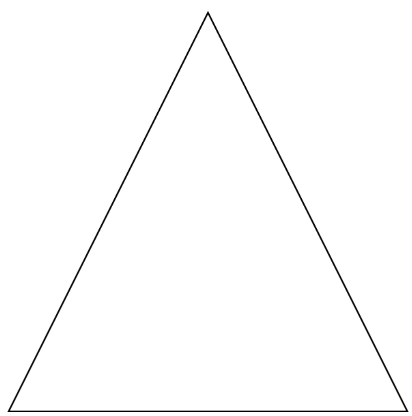

Figure 2.31

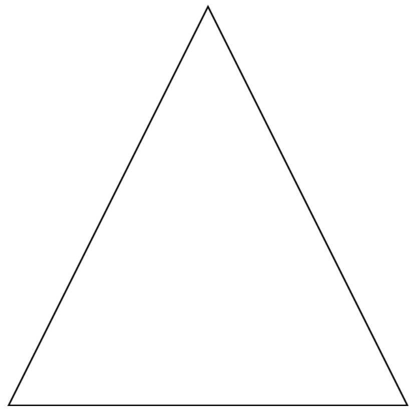

Figure 2.32

1.8 What fraction of one cheese did each girl receive?

1.9 What fraction of all the cheese (two cheeses) did each girl receive?

Just then the bell rang for the end of break. When they were settled in the classroom, their educator said, “Today we are going to consider ‘Equal Sharing’ and you may draw how to share things equally.” Of course, our four friends found the lesson very easy and their educator was pleased with them. She wondered how they were able to do the work so quickly and correctly. Only after the lesson did they explain how they had spent their break-time!

TEST YOUR SKILLS: FRACTIONS IN DIAGRAMMATIC FORM; EQUAL SHARING [LO 1.3, 1.5, 1.8]

See if you can complete the work that the educator gave her class:

1. Share 2 Marie biscuits equally amongst 5 learners. Draw lines on the circles below to show how you would do this and then write down how much each learner received altogether.

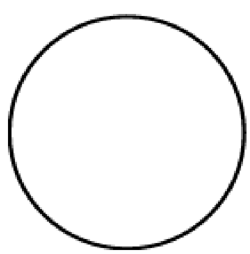

Figure 2.33

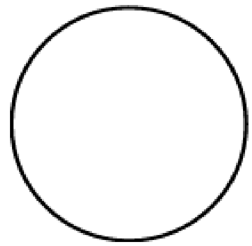

Figure 2.34

Answer: ______________________

1. Share 5 Provita biscuits equally between 2 girls. Draw lines on the rectangles below to show how they were shared equally between the 2 girls. Then write down how much each girl received altogether.

Answer:_________________________

1. Three learners want to share a tin of Coke equally. They each have a paper cup. How much of the Coke will each learner receive? Draw dotted lines on the can below to show how much each learner will get. Then write down what part of the Coke each learner will receive.

Answer: ………………………………………………

4. Share 2 loaves of bread equally amongst 3 workers. How much will each worker receive? (You may draw if it helps.)

5. Share 7 sausage rolls equally amongst 6 boys. How much sausage roll will each boy receive? (You may draw if it helps.)

6. Share 8 sandwiches equally amongst 3 boys. How much will each boy receive? (You may draw if it helps.)

7. Share 8 bananas equally amongst 7 boys. How much will each boy receive? (You may draw if it helps.)

8. Share 17 slices of polony equally amongst 8 boys. How much will each boy receive? (You may use the drawing if it helps.)

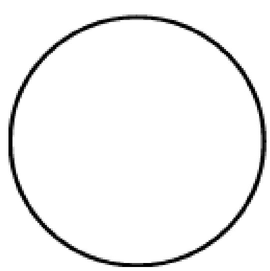

Figure 2.35

Answer: ……………………………………

2.2.6 Assessment

Learning outcomes(LOs)
LO 1
Numbers, Operations and RelationshipsThe learner will be able to recognise, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.
Assessment standards(ASs)
We know this when the learner:
1.1 counts forwards and backwards in a variety of intervals;
1.3 recognises and represents the following numbers in order to describe and compare them: common fractions with different denominators, common fractions in diagrammatic form, decimal fractions and multiples of single-digit numbers;
1.3.2 common fractions with different denominators, including halves, thirds, quarters, fifths, sixths, sevenths and eighths;
1.3.3 common fractions in diagrammatic form;
1.3.4 decimal fractions of the form 0,5; 1,5 and 2,5; etc., in the context of measurement;
1.3.6 multiples of single-digit numbers to at least 100;
1.5 recognises and uses equivalent forms of the numbers including common fractions and decimal fractions;
1.5.1 common fractions with denominators that are multiples of each other;
1.5.2 decimal fractions of the form 0,5; 1,5 and 2,5, etc., in the context of measurement;
1.7 solves problems that involve comparing two quantities of different kinds (rate);
1.7.1 comparing two or more quantities of the same kind (ratio);
1.8 estimates and calculates by selecting and using operations appropriate to solving problems that involve addition of common fractions, multiplication of at least whole 2-digit by 2-digit numbers, division of at least whole 3-digit by 1-digit numbers and equal sharing with remainders;
1.8.3 addition of common fractions in context;
1.8.6 equal sharing with remainders;
1.9 performs mental calculations involving:
1.9.2 multiplication of whole numbers to at least 10 x 10;
continued on next page

1.12 recognises, describes and uses:, and
1.12.1 the reciprocal relationship between multiplication and division (e.g. if 5 x 3 = 15 then 15 ÷ 3 = 5 and 15 ÷ 5 = 3;
1.12.2 the equivalence of division and fractions (e.g. 1 ÷ 8 = 1/8);
1.12.3 the commutative, associative and distributive properties with whole numbers.

Table 2.31

2.2.7 Memorandum

ACTIVITY 1– recognising common fractions

1. Missing numbers: ...; 3; 6; 10
2. Common fractions

2.1 fifths
2.2 sixths
2.3 sevenths
2.4 eighths
2.5 ninths
2.6 tenths
TEST YOUR SKILL

- and 1.2 Circle in half vertically; circle in half horizontally

2.1 and 2.2 Rectangle divided into thirds horizontally and vertically.
2.3 3
3.1 2; halves 3.2 3 thirds
4. Shading; one half is bigger than one third.
5. tenths; 10 equal parts; eighths; 8 equal parts
3. HANDS ON
3.1 Triangle folded in half; half coloured in.
3.2 Circle folded in quarters; three-quarters coloured in.
3.3 No
3.4 Rectangle folded into thirds; two-thirds shaded; second rectangle folded into sixths; two-sixths shaded.
3.5 Bar folded into eighths; two-eighths shaded; second bar folded into quarters; two-quarters shaded.
3.6 (a) < (b) [U+F03E] (c) < (d) < (e) [U+F03E] (f) <
ACTIVITY 2: the equivalence of division and fractions
1.1 (a) and (b)

Table 2.32

1.2 (a) and (b)

Table 2.33

1.3 (a) and (b)

Table 2.34

ACTIVITY 3: problems
1.1 six biscuits; one and a half shaded
1.2 one and a half
1.3 two-eighths / one-quarter
1.4 2
1.5

Table 2.35

1.6 2 and a quarter

- two triangles each halved
- half
- quarter

2.2.7.1 TEST YOUR SKILLS

1. two circles each divided into fifths; two-fifths
2. one rectangle is halved; 2 and a half
3. a cylinder divided into thirds; one-third
4. two-thirds
5. one and a sixth
6. two and two-thirds
7. one and a seventh

8. two and an eighth

2.3 Comparing fractions[3]

2.3.1 MATHEMATICS

2.3.2 Grade 4

2.3.3 NUMBERS, FEACTIONS, DECIMALS AND NUMBER PATTERNS

2.3.4 Module 8

2.3.5 COMPARING FRACTIONS

Activity 1:
To compare fractions [LO 1.3]
1. Each of the following three bars represents one whole.

[3]This content is available online at <http://cnx.org/content/m30505/1.1/>.

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Table 2.36

The top bar shows thirds. The middle bar shows twelfths. The last bar shows sixths. You may use them to replace with the correct sign from: < and [U+F03E] to make the statements true:

1.1 $\frac{2}{3}\frac{5}{6}$
1.2 $\frac{5}{6}\frac{11}{12}$
1.3 $\frac{9}{12}\frac{2}{3}$
1.4 $\frac{3}{12}\frac{2}{6}$
2. Here again, each of the bars represents one whole.

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Table 2.37

The top bar shows . The lower bar shows .
You may use these bars to complete the following:

- two-fifths < tenths
- six-tenths < fifths
- four-fifths [U+F03E] tenths
- two-tenths < fifths
- Which is greater: four-tenths or four-fifths? .
- Which is greater: three-tenths or two-fifths? .
- Which is less: three-fifths or five-tenths? .

3. Here again, each of the bars represents one whole.

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Table 2.38

Look carefully at the bars above and then complete the following:

- half [U+F03E] eighths.
- two-eighths < quarters
- three-quarters [U+F03E] five .

Activity 2:

To count forwards and backwards in fractions [LO 1.3]
1. Group Discussion
Read the following and discuss who was correct:
The educator said, “Count in halves from 0 to 10.”

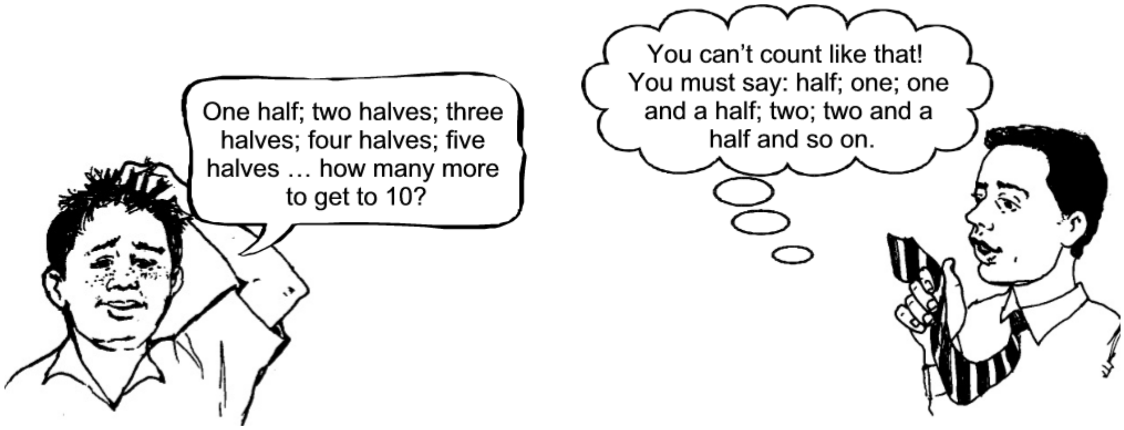

Figure 2.36

Who was correct?

Actually both ways of counting were correct. Let's look at the way Peter did it.

$\frac{1}{2}$; $\frac{2}{2}$; $\frac{3}{2}$; $\frac{4}{2}$; $\frac{5}{2}$ What do you notice?

Yes, after the first two, the top part of the fraction is bigger than the bottom part.

What does this mean? Discuss.

Yes, it means that there is at least one whole hidden in there.

$\frac{2}{2}$ = one whole; $\frac{3}{2} = 1\frac{1}{2}$ What do four halves mean? What do five halves mean?

When the top part of the fraction is larger than the bottom part, we call it an IMPROPER FRACTION.

$\frac{5}{2}$ is an IMPROPER FRACTION; the top bit is larger than the bottom bit.

Sometimes it is necessary to make improper fractions in calculations. However, most educators like the final answer to a calculation to be a mixed number.

2. ORAL WORK: Now do these counting exercises. You may use either improper fractions or mixed numbers. Ask a friend to check your answers.

2.1 (a) Count in halves from 0 to 10.

(b) Count backwards in halves from 100 to 90

2.2 (a) Count in thirds from 6 to 10.

(b) Count backwards in thirds from 30 to 25.

2.3 (a) Count in quarters from 12 to 16.

(b) Count backwards in quarters from 100 to 96.

2.4 (a) Count in fifths from 50 to 55.

(b) Count backwards in fifths from 10 to 6.

2.5 (a) Count in sixths from 24 to 26.

(b) Count backwards in sixths from 36 to 30.

2.6 (a) Count in sevenths from 0 to 4.

(b) Count backwards in sevenths from 21 to 17.

2.7 (a) Count in eighths from 0 to 3.

(b) Count backwards in eighths from 10 to 8.

2.8 (a) Count in tenths from 3 to 8.

(b) Count backwards in tenths from 100 to 97.

Activity 3:

To recognise equivalent fractions [LO 1.5, 2.1]

Two boys study a measuring beaker half full:

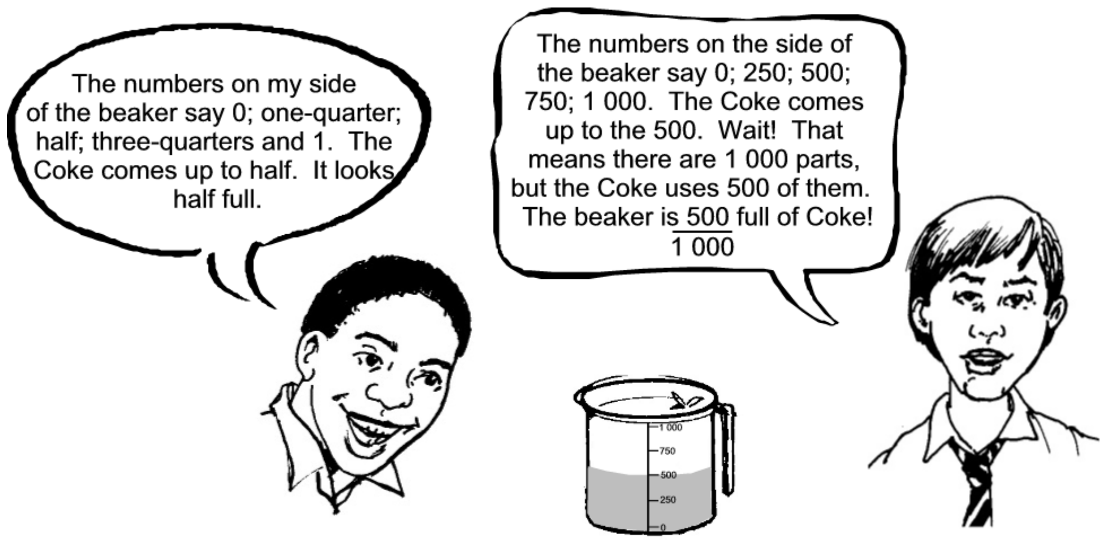

Figure 2.37

Who is correct? Yes, they both are. There is only one beaker and one quantity of Coke, but it can be called $\frac{1}{2}$ and $\frac{500}{1\ 000}$; thus, different names for the same quantity.

We say $\frac{1}{2}$ and $\frac{500}{1\ 000}$ are EQUIVALENT FRACTIONS.

The thousandths are smaller pieces, but there are 500 of them; enough to make a half.

1. Now see if you can work out the equivalent fractions here (Use the bars in the diagram if necessary):

- Half a sausage roll is equivalent to ………….. quarters of an identical sausage roll.

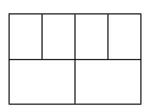

Table 2.39

Equivalence occurs when the whole may have been cut into a different number of parts, but there are enough of them to make the same quantity as there is in the other fraction. We write it in words or with digits, thus $\frac{1}{2} = \frac{2}{4}$ and we use the = sign.

1.2 Half a sausage roll is equivalent to sixths of an identical sausage roll.

- Half a sausage roll is equivalent to eighths of an identical

sausage roll. Now make up one of your own:

- Half a sausage roll is equivalent to of an identical sausage roll.

2. Halves.

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Table 2.40

- The top bar shows halves. Shade in one half.
- Now see if you can find fractions in the other bars equivalent to a half. Write them all down below. Try to spot some pattern in your answers. Discuss this with a friend.

3. Thirds.

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Table 2.41

- The top bar shows thirds. Shade in one third.
- Now see if you can find fractions in the other bars equivalent to one third. Write them all down below.

Try to spot some pattern in your answers. Discuss this with a friend.
3.3 Find all the fractions that are equivalent to two-thirds. Write them down below:
4. Fifths.

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Table 2.42

- The top bar shows fifths. Shade in one fifth.
- Now see if you can find fractions in the other bars equivalent to one fifth. Write them all down

Try to spot some pattern in your answers. Discuss this with a friend.
4.3 Now see if you can find fractions in the other bars equivalent to two fifths. Write them all down. Try to spot some pattern in your answers. Discuss this with a friend.
4.4 Now see if you can find fractions in the other bars equivalent to three fifths. Write them all down. Try to spot some pattern in your answers. Discuss this with a friend.
4.5 Now see if you can find fractions in the other bars equivalent to four fifths. Write them all down. Try to spot some pattern in your answers. Discuss this with a friend.
5. Patterns.
5.1 Spot the pattern and fill in the missing parts:

FRACTION	EQUIVALENT FRACTIONS			
$\frac{1}{2}$	$\frac{}{4}$	$\frac{}{8}$	$\frac{8}{}$	$\frac{16}{}$

Table 2.43

- Try to write down the patterns that you saw.
- Spot the pattern and fill in the missing parts:

FRACTION	EQUIVALENT FRACTIONS			
$\frac{1}{3}$	$\frac{}{6}$	$\frac{}{9}$	$\frac{6}{}$	$\frac{}{12}$

Table 2.44

5.4 Try to spot patterns for making equivalent fractions for other fractions. Discuss them in class.

Activity 4:

To use equivalent fractions [LO 1.5, 1.7]

1. Joan spent three-quarters of her holiday at home and her brother, Willie, spent five-eighths of the same holiday at home. Which of them spent more time at home that holiday?

2. David's rabbits ate $\frac{3}{5}$ of a bunch of carrots. Roy's rabbits ate $\frac{7}{10}$ of an identical bunch of carrots. Which boy had more carrots left over?

3. Len's mother made three identical tins of shortbread. She cut the first one into three pieces; the second one into six pieces and the third one into twelve pieces. Len ate one piece from the first tin. His brother, Bruce, ate three pieces from the second tin and their father ate four pieces from the third tin.

3.1 Who ate the most shortbread?

3.2 Which of them ate the same quantity of shortbread?

4. Amos looked after the vines at the end of his grandfather's vegetable garden. When the grapes were ripe, Amos picked 15 kilograms of delicious Hanepoot grapes. His grandfather said he could put them in packets that held $1\frac{1}{2}$ kg of grapes each, and sell them for R6 each, or he could put the grapes in boxes which held 5 kg of grapes, and sell each box for R20. Amos wanted to make as much money as possible.

4.1 How many packets would Amos need if he chose packets?

4.2 How many boxes would he need if he chose boxes?

4.3 Would he make more money by using the packets or the boxes, and if so, how much more would he make? Explain your answer.

2.3.6 Assessment

Learning outcomes(LOs)
LO 1
Numbers, Operations and RelationshipsThe learner will be able to recognise, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.
continued on next page

Assessment standards(ASs)
We know this when the learner:
1.1 counts forwards and backwards in a variety of intervals;
1.3 recognises and represents the following numbers in order to describe and compare them: common fractions with different denominators, common fractions in diagrammatic form, decimal fractions and multiples of single-digit numbers;
1.3.2 common fractions with different denominators, including halves, thirds, quarters, fifths, sixths, sevenths and eighths;
1.3.3 common fractions in diagrammatic form;
1.3.4 decimal fractions of the form 0,5; 1,5 and 2,5; etc., in the context of measurement;
1.3.6 multiples of single-digit numbers to at least 100;
1.5 recognises and uses equivalent forms of the numbers including common fractions and decimal fractions;
1.5.1 common fractions with denominators that are multiples of each other;
1.5.2 decimal fractions of the form 0,5; 1,5 and 2,5, etc., in the context of measurement;
1.7 solves problems that involve comparing two quantities of different kinds (rate);
1.7.1 comparing two or more quantities of the same kind (ratio);
1.8 estimates and calculates by selecting and using operations appropriate to solving problems that involve addition of common fractions, multiplication of at least whole 2-digit by 2-digit numbers, division of at least whole 3-digit by 1-digit numbers and equal sharing with remainders;
1.8.3 addition of common fractions in context;
1.8.6 equal sharing with remainders;
1.9 performs mental calculations involving:
1.9.2 multiplication of whole numbers to at least 10 x 10;
1.12 recognises, describes and uses:, and
1.12.1 the reciprocal relationship between multiplication and division (e.g. if 5 x 3 = 15 then $15 \div 3 = 5$ and $15 \div 5 = 3$;
1.12.2 the equivalence of division and fractions (e.g. $1 \div 8 = 1/8$);
1.12.3 the commutative, associative and distributive properties with whole numbers.
Learning outcomes(LOs)
continued on next page

LO 2
Patterns, Functions and AlgebraThe learner will be able to recognise, describe and represent patterns and relationships, as well as to solve problems using algebraic language and skills.
Assessment standards(ASs)
We know this when the learner:
2.1 investigates and extends numeric and geometric patterns looking for a relationship or rules;
2.1.1 represented in physical or diagrammatic form;
2.1.2 not limited to sequences involving constant difference or ratio;
2.1.3 found in natural and cultural contexts;
2.1.4 of the learner's own creation;
2.2 describes observed relationships or rules in own words;
2.3 determines output values for given input values using verbal descriptions and flow diagrams;
2.3.1 verbal descriptions;
2.3.2 flow diagrams.

Table 2.45

2.3.7 Memorandum

ACTIVITY 1: comparing fractions
1.1 < 1.2 < 1.3 .[U+F03E] 1.4 <
2.1 five (or six, seven, eight, nine) tenths
2.2 four
2.3 seven (or six, five, four, three, two, one) tenths

- two (or three, four, five) fifths
- four-fifths
- two-fifths

2.7 five-tenths

- three (or two, one)
- two (or three, four)
- eighths

ACTIVITY 2: counting in fractions
1.1 Group discussion
ACTIVITY 3: equivalent fractions
1.1 shading; 2 quarters
1.2 3 sixths 1.3 four eighths 1.4 own

- shading
- half = two-quarters = four-eighths

- shading
- one-third = two-sixths = four-twelfths = eight twenty-fourths
- two-thirds = four-sixths = eight-twelfths = sixteen twenty-fourths

4. Fifths
4.1 shading
4.2 ; ; ;
4.3 ; ; ;
4.4 ; ; ;
4.5 ; ; ;
Discuss patterns
5. Patterns
5.1 Missing parts: 2; 4; 16; 32

- Pattern
- Missing parts: 2; 3; 18; 4
- Class discussion: patterns for making equivalent fractions.

ACTIVITY 4: using equivalent fractions
1. Joan; =
2. David; = , David had more carrots *left over*.
3.1 Len: one third; Bruce three-sixths (i.e. half); Dad: four-twelfths so Bruce ate the most.

- Len and his father.

4.1 1 x 10 = 15; 10 packets
4.2 5 x 3 = 15; 3 boxes
4.3 10 x R6 = R60; 3 x R20 = R60He'd get the same amount of money whether he used boxes or packets.
3. 1 - = - =
4. + = + = = 1

Table 2.46

0 1 2

2.4 Recognise and represent decimal fractions[4]

2.4.1 MATHEMATICS

2.4.2 Grade 4

2.4.3 NUMBERS, FEACTIONS, DECIMALS AND NUMBER PATTERNS

2.4.4 Module 9

2.4.5 RECOGNISE AND REPRESENT FRACTIONS

Activity 1:
To recognise and represent decimal fractions [LO 1.3]
RECOGNIZING DECIMALS

[4]This content is available online at <http://cnx.org/content/m30506/1.1/>.

1. What are decimals?
1.2 Think back to Place Value: Thousands; Hundreds; Tens and Units.
Complete the following:

1 000 [U+F0B8] 10 = 100
100 [U+F0B8] 10 =
10 [U+F0B8] 10 =
1 [U+F0B8] 10 = ?

Table 2.47

1.3 Now check your answers on the calculator.
The calculator says that 1 [U+F0B8] 10 = 0,1. What does 0,1 then mean? Discuss with a friend.

1.4 Draw lines on the bar below to show tenths. One has been divided by 10. We say that 0,1 is one tenth. It is the only way in which calculators can write one tenth, because of the way that they have been programmed. Now label each section on the bar below 0,1.

Table 2.48

What is the meaning of 0,1? We have found that 1 [U+F0B8] 10 = 0,1.
Think back to Fractions: we said: 1 [U+F0B8] 2 = $\frac{1}{2}$
So 1 [U+F0B8] 10 = $\frac{1}{10}$
1 [U+F0B8] 10 = $\frac{1}{10}$ = 0,1
0,1 is just another way of writing $\frac{1}{10}$
Study the diagram:

Thousands1 000	Hundreds100	Tens10	Units1	Tenths

Table 2.49

Thousands1 000	Hundreds100	Tens10	Units1	Tenths $\frac{1}{10}$
7	1	9	3	6
5	0	6	9	1

Table 2.50

How do we show the end of the whole number when there are no headings?
We use a DECIMAL COMMA.
What are the numbers that have been written in the columns?

- 7 193, 6 = 7 × 1 000 + 1 × 100 + 9 × 10 + 3 × 1 + six tenths
- 5 069,1 = 5 × 1 000 + 0 + 6 × 10 + 9 × 1 + $\frac{1}{10}$

Our calculators cannot write common fractions as we can; they are only machines that have been programmed to use place value, so they can only write decimal fractions.

Remember: We use a DECIMAL COMMA
to show the END OF THE WHOLE NUMBER
and the BEGINNING OF THE DECIMAL FRACTION

2. Now write the following decimal numbers in their expanded form under the correct heading in the columns below:

2.1 (a) 1 456,3 (b) 4 601,9 (c) 8,5 (d) 31, 7 (e) 456,2

	X 1 000	× 100	× 10	× 1	× 0,1(tenths)
(a)					
(b)					
(c)					
(d)					
(e)					

Table 2.51

The FIRST digit after the decimal comma is always TENTHS.

2.2 Now write them again in their expanded form:

(a) 1 456,3 = 1 × 1 000 + 4 × 100 + 5 × 10 + 6 × 1 + 3 × 0,1

Activity 2:

To compare fractions [LO 1.5]

1. Carefully consider the value of each digit and use the correct sign from:<; [U+F03E] ; = to > compare the following:

1.1 1,5 _____1,7 1.4 45,9 ____62,3
1.2 6,3 ____ 6,1 1.5 13,2 ____8,6
1.3 24,7____ 42,3 1.6 57,5 ____58,2

2. Encircle the largest number:

43,7; 41,9; 43,1; 49,1; 41,5

3. Write down the number that is:

	Answer		Answer
3.1 one more than 9,9	3.1	3.5 0,1 less than 7,1	3.5
3.2 0,1 more than 5,3	3.2	3.6 0,1 more than 99,0	3.6
3.3 0,1 less than 6	3.3	3.7 0,1 more than 5,8	3.7
3.4 0,1 less than 8,3	3.4	3.8 0,1 less than 10	3.8

Table 2.52

Activity 3:

To convert from fractions to decimal fractions and vice versa [LO 1.5]

Group discussion.

1. Read the following conversation between John and Sarah.

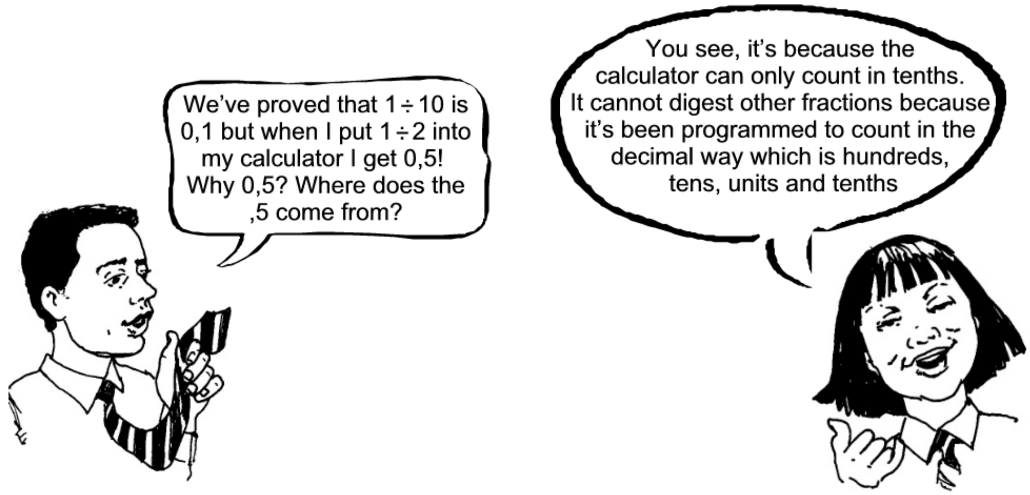


Figure 2.38

- Was Sarah's answer correct? It did not seem to help John completely. Where did the ,5 come from? Discuss. Try to explain why half = 0,5 on a calculator.
- Which of you were wide awake? All of you? Did you all know? Wonderful! Yes, it's because the calculator counts in tenths and five-tenths = one-half. The poor calculator has to use equivalent fractions to make tenths from things like halves and quarters and any fractions that are not tenths (hundredths and thousandths, but they come later).

With a calculator:

2. Make decimal fractions from the following:

2.1 $\frac{3}{4}$ = 3 [U+F0B8] 4 = 0, ____

2.2 $\frac{2}{5}$ = 2[U+F0B8]5 =
2.3 $\frac{3}{5}$ =
2.4 $\frac{4}{5}$ =
2.5 $\frac{5}{5}$ =
2.6 $\frac{1}{4}$ =

Table 2.53

We can convert any ordinary fraction to decimals in that way.

3. Make one-third into a decimal: $\frac{1}{3}$ = 1 [U+F0B8] 3 =_____

Can you think of a reason why the answer is the way it is?

Without a calculator:

4. Write down equivalent fractions for each of the following and then write them as decimal fractions:

Fraction	Fraction as tenths	Decimal fraction
half		
one third	Can't	

Table 2.54

Fraction	Fraction as tenths	Decimal fraction
two-thirds	Can't	
one-quarter		
three-quarters		
one-fifth		
two-fifths		
three-fifths		
four-fifths		
one-sixth	Can't	
one-eighth		

Table 2.55

(Some of the above have more than one decimal place but it is good to know about them.)

5. What about the thirds and sixths and others that cannot be made into tenths? Use division.

- one-third = 1 [U+F0B8] 3 =
- two-thirds = 2 [U+F0B8] 3 =

Use your own method for the division or use a calculator. $\frac{1}{3}$ = 1 [U+F0B8] 3

Or one way: ? x 3 = 1

0 x 3 = 0,0

0,3 x3 = 0,9

0,03 x 3 = 0,09

0,99 (which is nearly 1)

so: (0 x 3) + (0,3 x 3) + (0,03 x 3)

0 + 0,3 + 0,03

= 0,333

(and the calculator will go on dividing: 0,333)

We say: 0,3 recurring or 0,3[U+05AF](The dot means recurring.)

TEST YOUR PROGRESS

1. Solve without a calculator:

1.1 17 × 26

1.2 153 [U+F0B8] 9

2. Share 11 sausage rolls equally amongst 10 boys. How much sausage roll will each boy receive?

3. Share 12 sausage rolls equally amongst 10 boys. How much sausage roll will each boy receive?

4. Mike drinks $1\frac{1}{2}$ mugs of milk for breakfast. His sister, Sharon, drinks $\frac{3}{4}$ of a mug of milk. How much milk have they drunk altogether?

5. Write the following in expanded notation:

5.1 64,8 =
5.2 341,2 =

Table 2.56

6. Write as decimals:

- Three and four-fifths = ………………………
- One and three-tenths = …………………..
- Five and one-quarter = ………………….
- $4\frac{1}{2}$ = …………………..

7. From<; > ; = write down the correct sign to make the following true:

- 2,4 _ _ _ _ 4,2
- 1,7 _ _ _ _ _2,1

8. Write down the number that is:

	Answer
one tenth more than 45,9	
one tenth less than 10	

Table 2.57

2.4.6 Assessement

Learning outcomes(LOs)
LO 1
Numbers, Operations and RelationshipsThe learner will be able to recognise, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.
Assessment standards(ASs)
We know this when the learner:
1.1 counts forwards and backwards in a variety of intervals;
continued on next page

1.3 recognises and represents the following numbers in order to describe and compare them: common fractions with different denominators, common fractions in diagrammatic form, decimal fractions and multiples of single-digit numbers;
1.3.2 common fractions with different denominators, including halves, thirds, quarters, fifths, sixths, sevenths and eighths;
1.3.3 common fractions in diagrammatic form;
1.3.4 decimal fractions of the form 0,5; 1,5 and 2,5; etc., in the context of measurement;
1.3.6 multiples of single-digit numbers to at least 100;
1.5 recognises and uses equivalent forms of the numbers including common fractions and decimal fractions;
1.5.1 common fractions with denominators that are multiples of each other;
1.5.2 decimal fractions of the form 0,5; 1,5 and 2,5, etc., in the context of measurement;
1.7 solves problems that involve comparing two quantities of different kinds (rate);
1.7.1 comparing two or more quantities of the same kind (ratio);
1.8 estimates and calculates by selecting and using operations appropriate to solving problems that involve addition of common fractions, multiplication of at least whole 2-digit by 2-digit numbers, division of at least whole 3-digit by 1-digit numbers and equal sharing with remainders;
1.8.3 addition of common fractions in context;
1.8.6 equal sharing with remainders;
1.9 performs mental calculations involving:
1.9.2 multiplication of whole numbers to at least 10 x 10;
1.12 recognises, describes and uses:, and
1.12.1 the reciprocal relationship between multiplication and division (e.g. if 5 x 3 = 15 then 15 ÷ 3 = 5 and 15 ÷ 5 = 3;
1.12.2 the equivalence of division and fractions (e.g. 1 ÷ 8 = 1/8);
1.12.3 the commutative, associative and distributive properties with whole numbers.
Learning outcomes(LOs)
LO 2
Patterns, Functions and AlgebraThe learner will be able to recognise, describe and represent patterns and relationships, as well as to solve problems using algebraic language and skills.
continued on next page

Assessment standards(ASs)
We know this when the learner:
2.1 investigates and extends numeric and geometric patterns looking for a relationship or rules;
2.1.1 represented in physical or diagrammatic form;
2.1.2 not limited to sequences involving constant difference or ratio;
2.1.3 found in natural and cultural contexts;
2.1.4 of the learner's own creation;
2.2 describes observed relationships or rules in own words;
2.3 determines output values for given input values using verbal descriptions and flow diagrams;
2.3.1 verbal descriptions;
2.3.2 flow diagrams.

Table 2.58

2.4.7 Memorandum

ACTIVITY 1: recognising and representing decimal fractions

1.1 Missing numbers: 10; 1; one-tenth

1.2 Calculator answers: 10; 1; 0,1

0,1 means one-tenth

2.1

	x 1 000	x 100	x 10	x 1	x 0,1
(a)	1	4	5	6	3
(b)	4	6	0	1	9
(c)				8	5
(d)			3	1	7
(e)		4	5	6	2

Table 2.59

2.2 (b) 4 x 1 000 + 6 x 100 + 0 x 10 + 1 x 1 + 9 x 0,1

(c) 0 x 1 000 + 0 x 100 + 0 x 10 + 8 x 1 + 5 x 0,1 or just: 8 x 1 + 5 x 0,1

(d) 0 x 1 000 + 0 x 100 + 3 x 10 + 1 x 1 + 7 x 0,1 or just: 3 x 10 + 1 x 1 + 7 x 0,1

(e) 0 x 1 000 + 4 x 100 + 5 x 10 + 6 x 1 + 2 x 0,1 or just: 4 x 100 + 5 x 10 + 6 x 1 + 2 x 0,1

ACTIVITY 2: comparing decimal fractions

1.1 <

1.2 [U+F03E]

1.3 <

1.4 <

1.5 [U+F03E]

1.6 <

2. Encircled number: 49,1

3.1 10,9
3.2 5,4
3.3 5,9
3.4 8,2
3.5 7
3.6 99,1
3.7 5,9
3.8 9,9
ACTIVITY 3: converting from fractions to decimal fractions and vice versa
1. Discussion
2. With a calculator

- 0,75
- 2.2 0,4
- 2.3 0,6
- 2.4 0,8

2.5 0,8
2.6 0,25
3. 0,33333
4.

Fraction	Fraction as tenths	Decimal fraction
half	Five tenths	0,5
One-third	Can't	0,3333
Two-thirds	Can't	0,6666
One-quarter	Can't;	0,25
Three-quarters	Can't;	0,75
One-fifth	Two-tenths	0,2
Two-fifths	Four-tenths	0,4
Three-fifths	Six-tenths	0,6
Four-fifths	Eight-tenths	0,8
One-sixth	Can't	0,1666
One-eighth	Can't;	0,125

Table 2.60

- 0,333
- 0,666

2.4.7.1 TEST YOUR PROGRESS

1.1 442
1.2 17
2. one and one-tenth or 1,1 sausage rolls
3. one and two-tenths or 1 and a fifth sausage rolls (or 1,2)
4. two and a quarter mugs

- 6 x 10 + 4 x 1 + 8 x 0,1
- 3 x 100 + 4 x 10 + 1 x 1 + 2 x 0,1

- 3,8
- 1,3
- 5,25
- 4,5

- <
- <

- 46
- 9,9

Chapter 3

Term 3

3.1 Learn to read, tell the time and write the time from analogue clocks[1]

3.1.1 MATHEMATICS

3.1.2 Grade 4

3.1.3 MEASUREMENT, SPACE AND SHAPE

3.1.4 Module 10

3.1.5 learn to read, tell and write the time from analogue clocks

Activity 1:

• To learn to read, tell and write the time from analogue clocks [LO 4.1]
• To use time measuring instruments, including watches and clocks [LO 4.3]

Table 3.1

TIME

- We know that there are $365\frac{1}{4}$ days in one year. For your calculations in this module you may use 365 days in a normal year and 366 days in a Leap Year. A Leap Year occurs every 4 years (four quarter days = 1 whole day). A Leap Year may be identified by dividing the last two digits of the year by 4. If there is no remainder, the year is a Leap Year. The year 2004 was a Leap Year. The extra day is always put in February.

There are 24 hours in one day. There are 7 days in a week

There are 60 minutes in an hour. There are 12 months in a year

There are 60 seconds in a minute.

[1]This content is available online at <http://cnx.org/content/m30507/1.1/>.

SHORT FORMS:
year = a
day = d
hour = h
minutes = min. (remember: m = metres!)
seconds = s
month = mo
week = wk
In this module we shall also come across tenths and hundredths of a second!

Analogue clocks and watches show twelve hours only. They do not indicate whether it's morning or afternoon.

Every hour the long hand goes right round the circle once. It counts the minutes.

Figure 3.1

The long hand tells us the minutes.
The short hand tells us the hour.
The short hand takes twelve hours to go round the circle once. It tells us the hour.

1. Write down the time on each of the clocks:

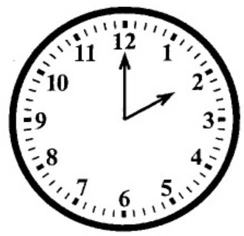


Figure 3.2

Figure 3.3

Figure 3.4

Hands on: practical work

On the next page you will find two circles. Cut out the first one. Fold it in half. Open it and shade one half. Write PAST in the half on the right and TO in the half on the left. Now paste your cut-out on the circle below.

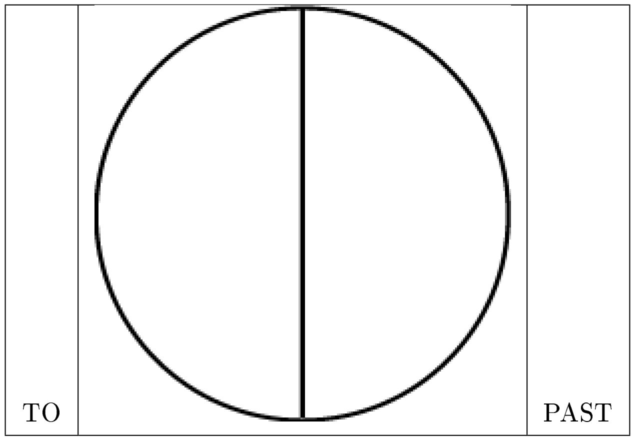


Table 3.2

When we read the minutes, the first half of the circle shows minutes *past* the hour. When the long minute hand has gone halfway round the circle, we say it is *half past* the hour. The second half shows minutes *to* the *next* hour.

Now cut out the second circle on the "cutting page" page. Fold it in half and in half again. Open the circle and draw dotted lines on the folds. We have divided the hour into 4 quarters. So we get a quarter past the hour and a quarter to the next hour. Write A QUARTER PAST on the right side and A QUARTER TO on the left side and paste your cut-out on the circle below.

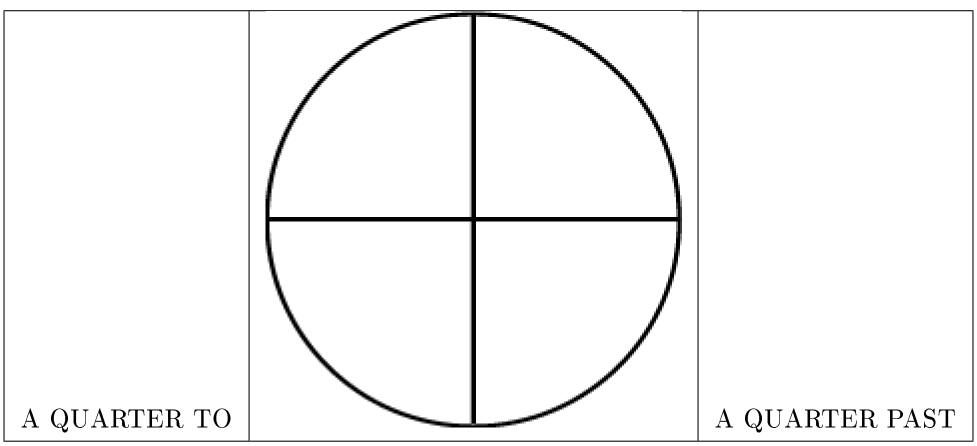


Table 3.3

for cutting out

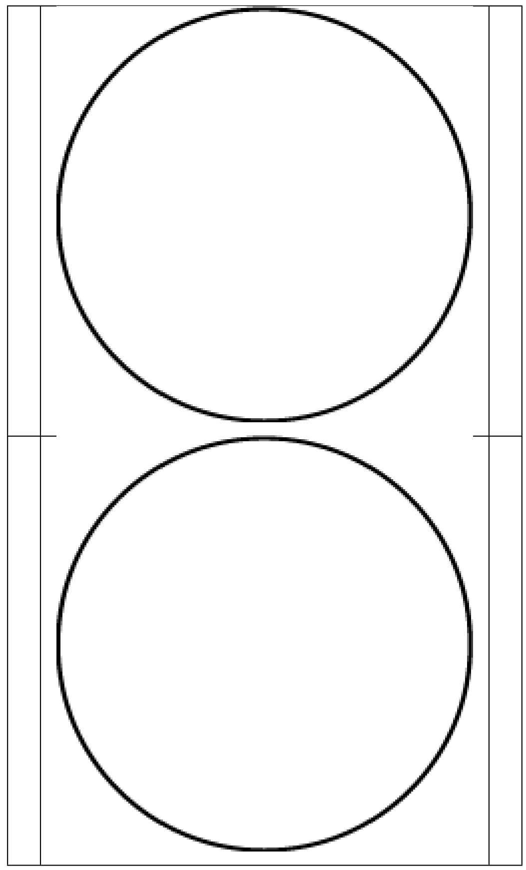


Table 3.4

Read the instructions very carefully; be sure you understand before you do each step.

Now we are going to write in the hours on the clock face. On the next page there are two more circles for you to cut out. Cut out the first one. Fold it in half. Fold it in half again. Do not open it. Now, fold the quarter in three (like an ice-cream cone). Can you predict how many parts there should be when you open it?

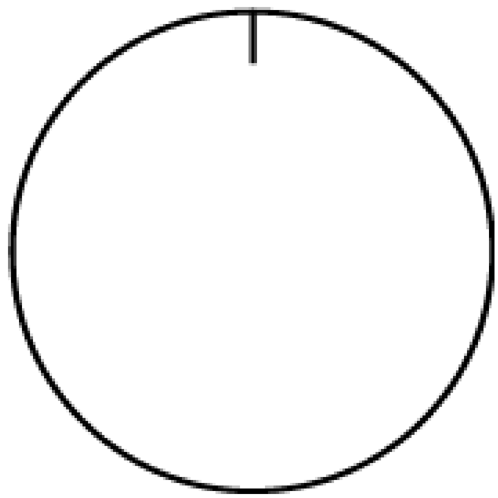


Figure 3.5

Yes, there should be 12 marks. Start with the top mark and label it *inside* the circle: 12. Then work clockwise and number each fold in the circle. (Your spaces between each number should be accurate because you made folds.) You have now written in *the hours*. Mark each fold at the edge of the circle and write in the number of the hour. (The first one has been indicated.) Paste it on the first circle on this page.

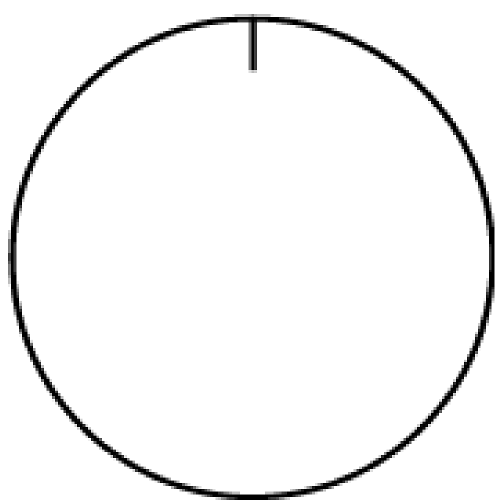


Figure 3.6

Now (on the cutting page) cut out the second circle. Mark in the hours as you did in the previous circle. Now you are going to mark in the minutes. There are 60 minutes in an hour, so how many minutes will there be between the numbers? Yes, 5, i.e. 5 *spaces*. Put little marks to show them and paste the circle on

top of circle number 4. You have made an analogue clock face.

For cutting out

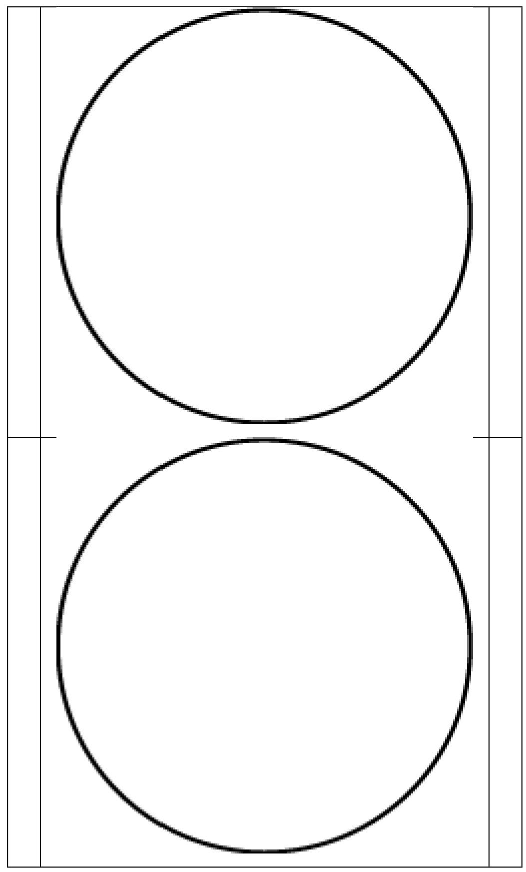


Table 3.5

TEST YOUR SKILLS: ANALOGUE CLOCKS

1. Below each of the following clocks, write the time:

Figure 3.7

Figure 3.8

1. On the following clock faces, draw in the long and the short hands carefully to show the time that has been written below:

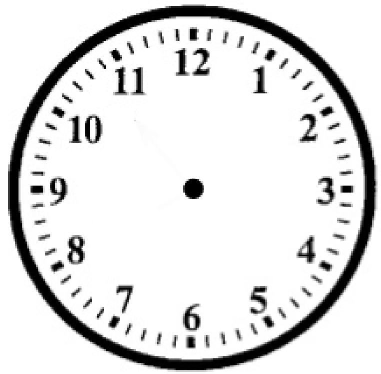


Figure 3.9

- 22 minutes past 2

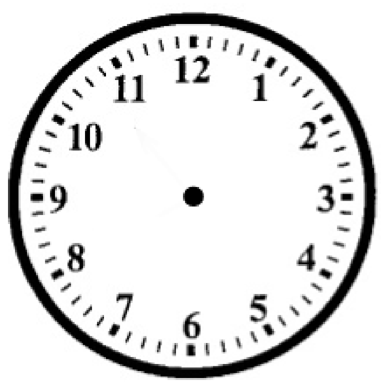


Figure 3.10

2.2 17 minutes to 10
(Did you remember that the hour hand is also moving, very slowly?)

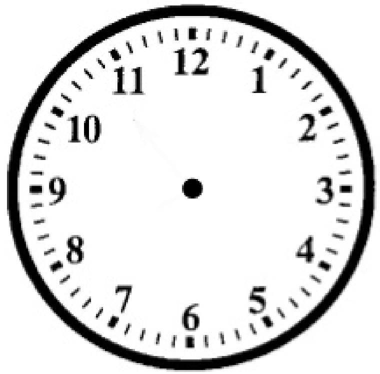


Figure 3.11

2.3 a quarter to four

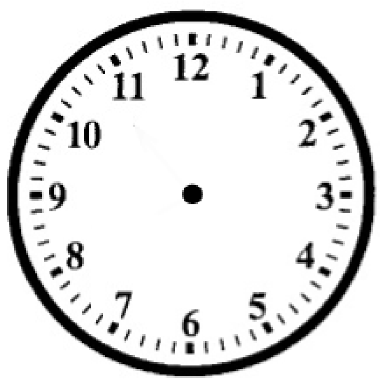


Figure 3.12

2.4 twelve o'clock

Analogue clocks cannot tell us whether it is morning or afternoon. We have to say it is 9 o'clock in the morning, or 4 o'clock in the afternoon. We use the following short forms:

a.m. = in the morning

p.m. = in the afternoon

Example:

A short way of writing 42 minutes past 10 o'clock in the morning is: 10.42 a.m. A short way of writing 36 minutes past 6 o'clock in the evening is: 6.36 p.m.

Activity 2:

- To learn to read, tell and write the time from digital and 24-hour clocks and stop watches [LO 4.1]
- To use time measuring instruments, including watches and clocks [LO 4.3]

- **Digital clocks** tell how many hours and minutes have passed since midnight. They work from midnight to midnight; 24 hours. This is useful because as soon as we see *more* than 12 hours, we know the time is *past* noon, e.g.
- 08:35The first two digits, the 08, tell us the hour if the hour is less than 10.The last two digits tell us the minutes past the hour

This clock says 35 minutes past 8 o'clock in the morning (the 08 is less than 12).

Midnight would be 24:00.

One minute past midnight may be written as 00:01 or 24:01.

Noon or midday would be 12:00.

One minute past noon would be 12:01.

1. Write as digital time:

- ten past five in the morning:
- twenty past four in the afternoon:
- a quarter to ten in the evening:
- three minutes to one in the morning:
- 8 p.m.
- one minute to ten a.m.

Study this example of a digital clock:

16:15

It shows the time, 4.15 p.m.

2.Now read the time on the analogue watch and write it correctly on the digital watch (in the frame on the right):

2.1

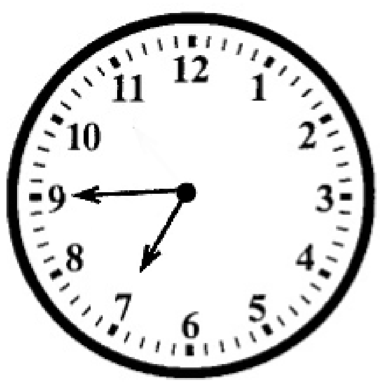


Figure 3.13

(in the morning)

2.2

Figure 3.14

(afternoon)

3. Draw hands on the analogue clock face to show the same time as is shown on the digital clock. Then write the time below the analogue clock to indicate if it is morning or afternoon. (Use the short form.)

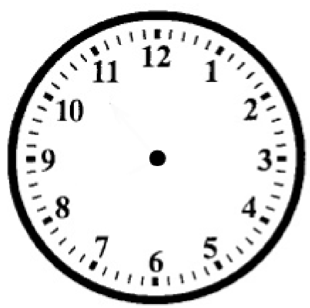


Figure 3.15

3.1
13.50

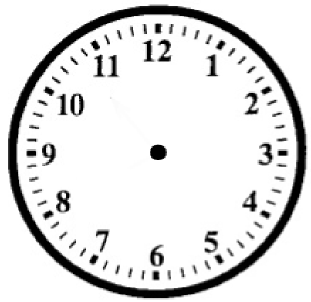


Figure 3.16

3.2
09.10

3.1.6 A twenty-four hour clock/ international clock

An international clock is based on the same idea as the digital clock.

This clock also works from midnight to midnight.

The half of the clock face on the right shows time before noon (midday).

The left half shows time from noon to midnight.

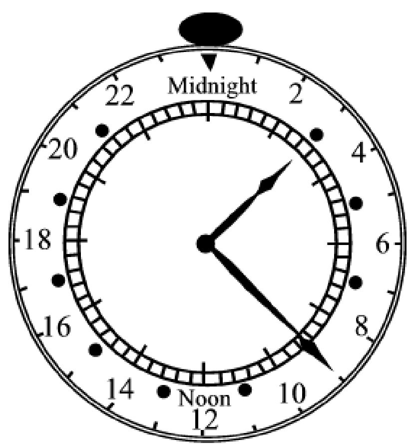


Figure 3.17

4.By looking at this clock, how would you know that the time shown on it is in the morning?

A Stop-watch.

We use this at swimming galas and athletics and other sports events because we have to measure decimal fractions of a second!

5. Write the time that is shown in the frame:

5.1 Swimming: freestyle relay: 4 x 25m:

1:17,53	

Table 3.6

5.2 Athletics: 1500m:

5:56,01	

Table 3.7

Activity 3:

To solve problems involving calculation and conversion between the appropriate units of time [LO 4.2]

1. The annual Athletics meeting was held at school. The girls' times in the 100 sprint were as follows:

Joy 14,9 seconds

Doreen 15,2 seconds

Petra 14,7 seconds

Kathleen 14,6 seconds

Marie 14,8 seconds

Barbara 15,5 seconds

1.1 Who won the race?

1.2 Explain why you give this answer.

1.3 What was the difference between Kathleen and Barbara's times?

2. Mother puts a chicken into the oven to roast at 11:50. It takes an hour and ten minutes to roast. When will she take it out of the oven?

Remember: there are 24 hours in a day.

There are 60 minutes in an hour.

There are 60 seconds in a minute.

3. Flight 502 leaves East London at 13:10 and arrives at Johannesburg at 15:30. Flight 504 leaves East London at 19:35 and arrives at Johannesburg at 21:50.

3.1 Did the planes arrive in the morning, afternoon or evening?

Flight 502 ____________ Flight 504____________.

3.2 Which flight was the faster, and how much faster than the other one was it? Write down your calculations clearly, step by step.

. 4. The workers in a car factory start work at 8 a.m. They work until 5 p.m. with a lunch break of one hour and two tea breaks of ten minutes each. For how long do they work each day?

Months of the year – old rhyme:

Thirty days have September, April, June and November;

All the rest have thirty-one,

Excepting February alone, which has twenty-eight days clear,

And twenty-nine in each Leap Year!

5. When we write dates the short way, we write the year, the month and then the day, e.g. 2003: 01: 24 (24 January 2003)

The school year was as follows:

School Term	Term Starts	Term Ends
1	2003:01:22	2003:03:28
2	2003:04:08	2003:06:27
3	2003:07:22	2003:09:26
4	2003:10:06	2003:12:05

Table 3.8

5.1 Write the date of the first day of the second term in full (the long way).
5.2 Write the date of the last day of the fourth term in full (the long way).
5.3 How long was the holiday between the first and second terms? Give your answer in weeks and days.
5.4 How long was the holiday between the second and third terms? Write down statements to show how you calculated this and give your answer in weeks and days.
5.5 How long was the holiday between the third and fourth terms? Give your answer in weeks and days.
6. Hannes is a keen fisherman. He was studying high tides because he was planning to go fishing off the rocks in the June holidays. Study this extract from the Table of High Tides in Cape Town and answer the questions that follow.

Date	June		July	
	a.m.	p.m.	a.m.	p.m.
1			0407	1630
2			0443	1707
3			0523	1748
Some	dates	have been	left out	here
28	0222	1448		
29	0256	1521		
30	0331	1555		

Table 3.9

- Study the morning high tides. Describe the pattern. Is it always like that?
- Do the afternoon high tides have a similar pattern? Write yes or no. .

6.3 High tide at Knysna is 43 min. later. When is the morning high tide at Knysna on 30 June?
6.4 How much time goes by between the morning high tide and the afternoon high tide on 28 June?
When we add or subtract time, remember that we are working with hours, minutes and seconds.
60 seconds = 1 minute
60 minutes = 1 hour
Example: 1h 45min.+ 2h 36min. You will think of your own way to do this.
One way might be:
1h 45min. +2h 36min. = 3h 81min. (Notice: there is 1h hidden in those minutes.)
= 4h 21min.
7. Calculate the answers and write down your calculations:
7.1 53 min. and 48 sec. + 14 min. and 34 sec
7.2 14 h 25 min. - 7 h 36 min.
Activity 4:
To describe and illustrate ways of measuring and representing time in different cultures throughout history [LO 4.4]
ASSIGNMENT (RESEARCH-BASED)
Your educator will help you to find reference books or take you to the library when you need information in this Assignment.
1. Read the following information.

People in the Ancient World did not have clocks and watches as we know them, but they did try to measure time. Some of their instruments for measuring time included: a sun dial; a water clock; a candle clock; burning oil and an hour-glass. Some of them were not very accurate.

2. Look up information in reference books or on the computer to find out what these instruments looked like and how they worked. Also try to find out which people used them and where they lived.

3. Choose four of the instruments named in number 1. Draw them and label each drawing clearly.

4. Explain how any two of them worked.

5. Make either a water clock or a candle clock (or one of the others) and show it to the class. Explain to the class how it works.

6. In the table below write down which people used each of the clocks you have drawn and where they lived:

Name of clock	People who used it	Where they lived

Table 3.10

7. Explain why these ancient instruments were not always very accurate. Write your answer below.

8. Try to think of a link between one of them and a modern instrument which we use. Write down your answer .

3.1.7 Assessment

LO 4
measurementThe learner will be able to use appropriate measuring units, instruments and formulae in a variety of contexts.
We know this when the learner:
4.1 reads, tells and writes analogue, digital and 24-hour time to at least the nearest minute and second;
4.2 solves problems involving calculation and conversion between appropriate time units including seconds, minutes, hours, days, weeks, months and years;
4.3 uses time-measuring instruments to appropriate levels of precision, including watches and clocks;
4.4 describes and illustrates ways of measuring and representing time in different cultures throughout history;
4.5 estimates, measures, records, compares and orders two-dimensional shapes and three-dimensional objects using S.I. units with appropriate precision for: • mass using grams (g) and kilograms (kg); • capacity using millilitres (ml) and litres (l); • length using millimetres (mm), centimetres (cm), metres (m) and kilometres (km);
4.6 solves problems involving selecting, calculating with and converting between appropriate S.I. units listed above, integrating appropriate context for Technology and Natural Sciences;
4.7 uses appropriate measuring instruments (with understanding of their limitations) to appropriate levels of precision including: • bathroom scales, kitchen scales and balances to measure mass; • measuring jugs to measure capacity; • rulers, metre sticks, tape measures and trundle wheels to measure length;
4.8 investigates and approximates (alone and/or as a member of a group or team): • perimeter, using rulers or measuring tapes.

Table 3.11

3.1.8 Memorandum

ACTIVITY 1

1.1 2

1.2 5

1.3 7

Practical work

TEST YOUR SKILLS

1.1 20 to 11 or 10.40

1.2 9.25 or 25 past 9

2 Drawing hands on clock faces (see module)

ACTIVITY 2

1.1 05:10
1.2 16:20
1.3 21:45
1.4 00:57 or 24:57

- 20:00
- 09:59

2.1 06:45
2.2 16:10
3.1 Drawing on clock-face: ten to two in the afternoon
3.2 Drawing on a clock-face: ten past nine in the morning
4. Morning; the hour hand is on the right side of the clock-face; in the afternoon it would be on the left side of this clock-face.
5.1 1 min. 17,53s
5.2 5 min. 56,01s
ACTIVITY 3 problems involving time
1.1 Kathleen
1.2 Her time is the shortest
1.3 0,9s
2. 13:00 or 1 p.m
3.1 Flight 502: afternoon; Flight 504: evening

- Flight 504 was 5 min. faster.

4. 7 h 40 min.
5.1 8 April 2003
5.2 5 December 2003
5.3 10 days
5.4 3 weeks 3 days
5.5 1 weeks 2 day

- The time from one morning high tide to the next increases; the increase varies from one minute to four minutes
- The time from one afternoon high tide to the next increases; the increase varies from one minute to 3 minutes.

(Note**: from morning high tide to afternoon high tide on the same day the time seems to decrease by 1min.each day, but not on 3 July.)**

- 04:14
- 12 h 26 min.

7.1 1h 8 min. 22 s.
7.2 6 h 49 min.
ACTIVITY 4 assignments
1. Read
2. Look up information
3.1 Drawings
3.2 Practical and oral
3.3 Own – practical and oral
3.4 Own – complete table
4. They could not measure seconds and parts of seconds; outside conditions (e.g. wind) influenced the instruments.
5. hour-glass; egg-timer

3.2 Visualise and name 3-dimensional objects in the environment[2]

3.2.1 MATHEMATICS

3.2.2 Grade 4

3.2.3 MEASUREMENT, SPACE AND SHAPE

3.2.4 Module 11

3.2.5 VISUALISE AND NAME 3-DIMENSIONAL OBJECTS IN THE ENVIRONMENT

Activity 1:

To recognise, visualise and name 3-dimensional objects in the environment [LO 3.1]

To describe, sort and compare them [LO 3.2]

Prisms, rectangular prisms, spheres, cylinders, pyramids, and other objects are found all round us.

1. Study the following three-dimensional objects in order to learn their names and be able to recognize and name similar objects in the world around us:

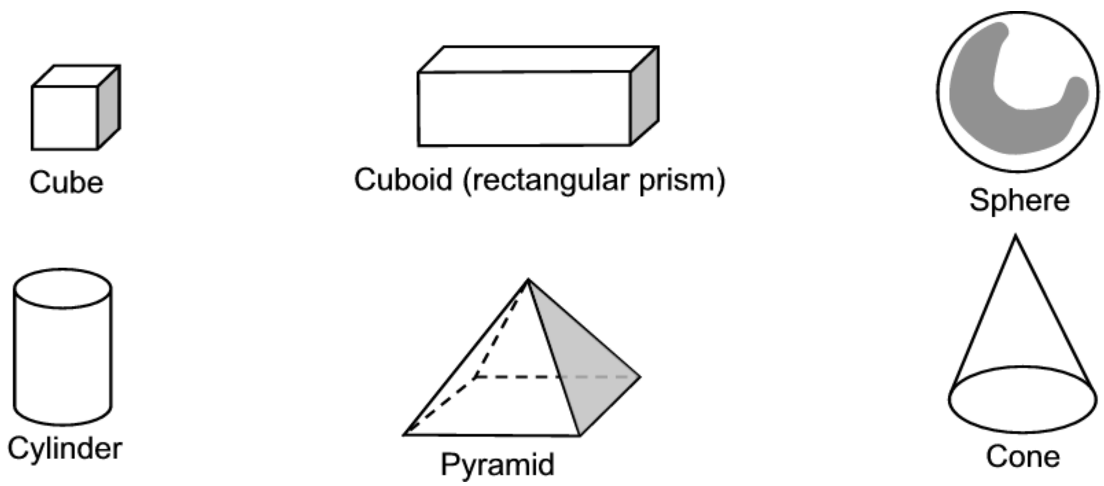


Figure 3.18

2. Objects in the world around us: now try to draw and name the 3-D objects:

Item	Drawing	Geometrical name of the object
Cricket ball		
Cube of sugar (lump)		
Tin of dog-food		

Table 3.12

[2]This content is available online at <http://cnx.org/content/m30508/1.1/>.

Ice-cream cone		
Box of matches		
Packet of cornflakes		
Triangular box of sweets		

Table 3.13

3. More shapes and objects.

3.1 Write each of the following solid objects under the correct geometrical heading: The sun; a string of spaghetti; a block of ice; an ordinary candle; the handle of a garden rake; a book; an orange; a brick; a block of margarine. Think of others and write them in the columns too, especially the columns that seem to be rather empty.

3.2 Compare your lists with those of your friends. If they have an item that you have not thought of, you may add it to your list.

Sphere	Cylinder	Cube	Cuboid (rectangular prism)	Pyramid	Cone

Table 3.14

. Write the correct geometrical name next to each of the following:

- a block of flats
- the walls of a rondavel
- a wigwam/tepee
- the roof of a rondavel
- the stones at Stonehenge

5. Look at the objects again. How many surfaces are there? Are the surfaces flat or curved? What shape are the surfaces? Fill in the missing words to describe the objects:

Object	Number of surfaces	Flat or curved surfaces	Shape of surfaces
A box of cornflakes			
A ball			
A cube of sugar			
A candle			
A pyramid			Sides:Base:

Table 3.15

Activity 2:

- To recognise, visualise and name 2-D shapes and 3-D objects in the environment [LO 3.1]
- To describe, sort and compare 2-D shapes and 3-D objects from the environment [LO 3.2]
- To make 2-D shapes, 3-D objects and patterns from tangrams [LO 3.5]
- Two-dimensional shapes are flat. We can draw them on a piece of paper. **Polygons** are all *closed* geometric shapes with *straight* sides.

1. **Polygons**: Use your pencil and ruler to practise drawing these.

3 sides: **Triangles**

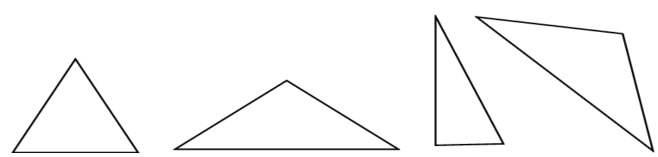


Figure 3.19

4 sides: **Quadrilaterals**

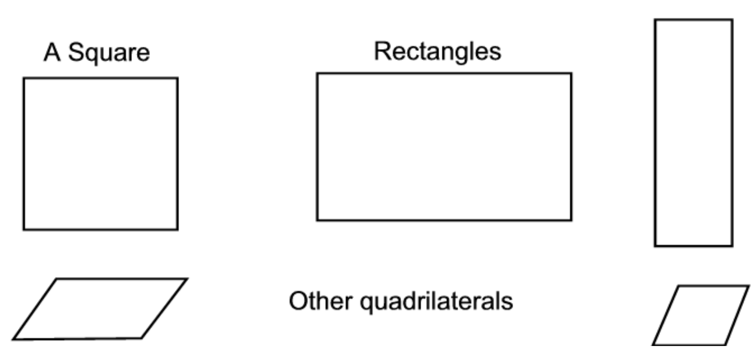


Figure 3.20

5 sides: **Pentagons** (when all the sides are equal in length, it is a *regular* pentagon; if they are different lengths, it is an *irregular* pentagon)

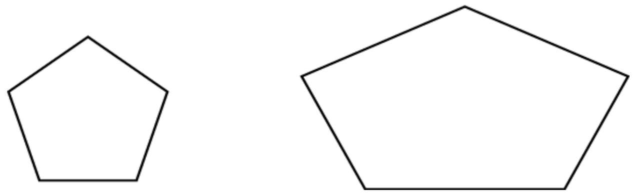


Figure 3.21

6 sides: **Hexagons**

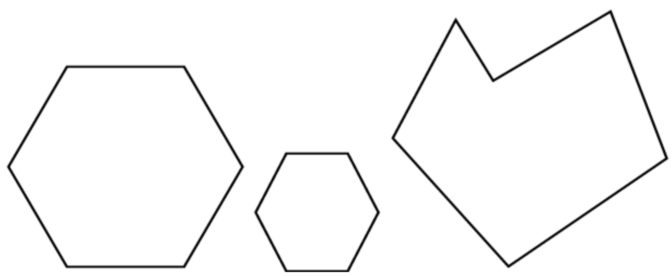


Figure 3.22

7 sides: **Heptagons**

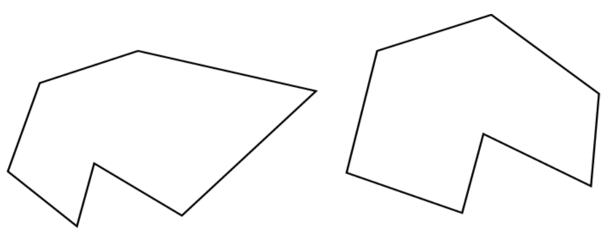


Figure 3.23

(Try to draw one regular heptagon.)

2. **Circles**

2.1 Circles are not polygons. Look at the circle below and compare it with the polygons that we have discussed:

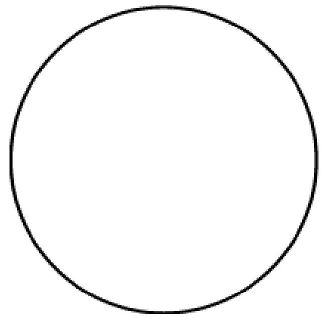


Figure 3.24

- Complete: The circle is not a polygon because ____________________________
- Now try to think of an example of each shape that we have considered, in your environment. Remember, they must all be flat because they are two-dimensional. In each shape below, fill in the road signs that you have seen in the world around you and on the way to school.

3.1 The Circle

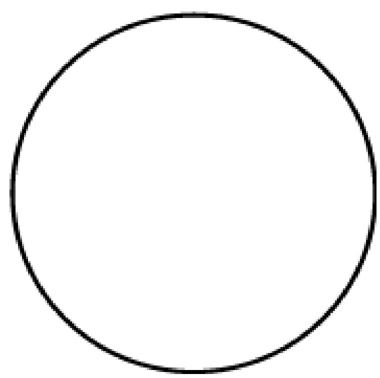


Figure 3.25

3.2 The Triangle

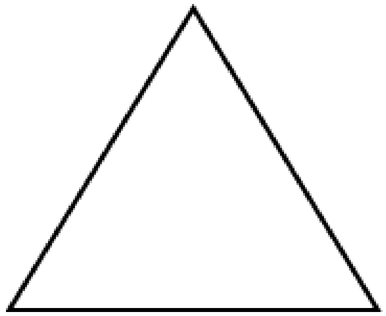


Figure 3.26

3.3 The Square

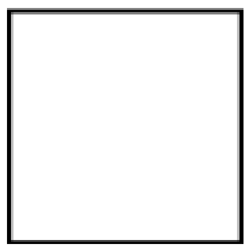


Figure 3.27

3.4 The Rectangle

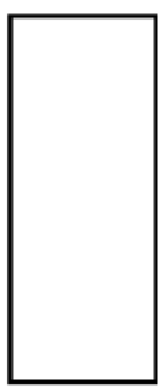


Figure 3.28

3.5 The Octogon

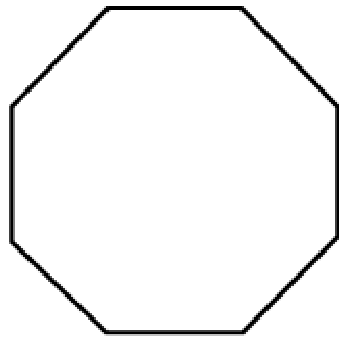


Figure 3.29

4. Cut out the TANGRAM on the next page. Cut out all the shapes in it.

4.1 Turn what's left of the sheet of paper over. Put the tangram together again to form the original square without looking at the second tangram. Now turn the paper over again and see if you did it correctly.

4.2 Now use the shapes to make:

a) a boat,
b) a human figure,
c) a dog,
d) other things.

4.3 Show your friends what you have made and discuss what you and they have made.

4.4 Paste your best one on paper and use it to decorate the classroom.

TANGRAMS FOR CUTTING OUT

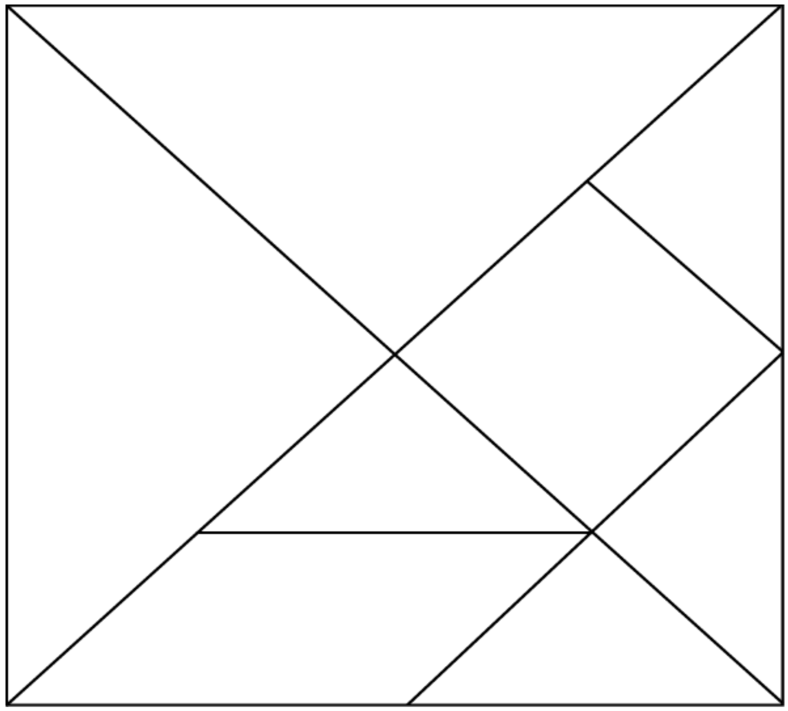


Figure 3.30

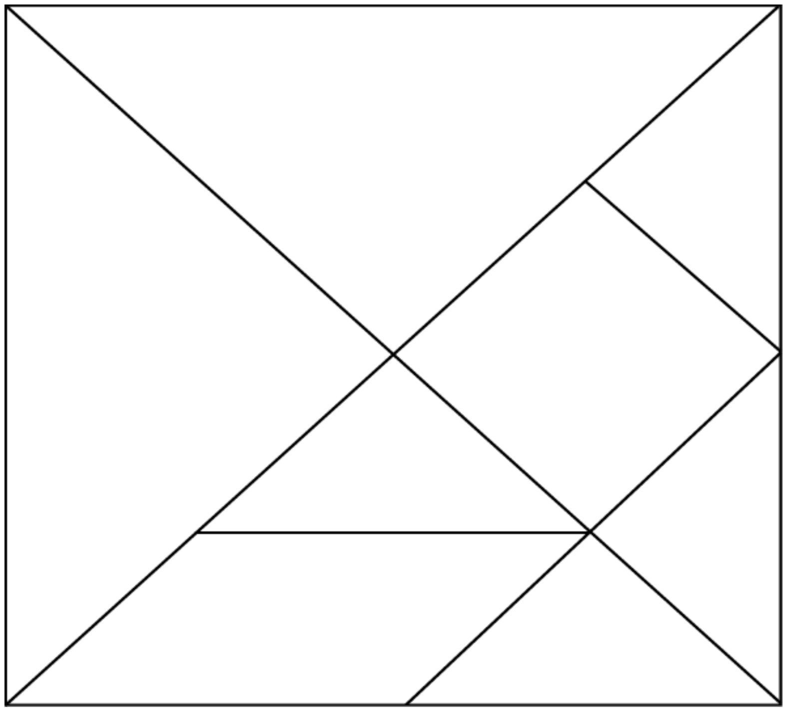


Figure 3.31

5. Study the triangles in the table.

- Fill in the number of sides and angles (corners) in each triangle.
- Encircle the correct statement about the sides and the angles(corners) of each triangle. (Later you will learn to measure the corners; just now decide by just looking at them.)

Triangle

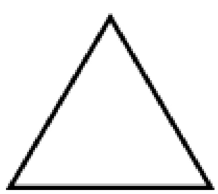


Figure 3.32

Number of sides: ……..
Length:

- all the same
- 2 the same

none the same
Number of angles:. . . ..
Size of angles:

- all the same
- 2 the same

none the same

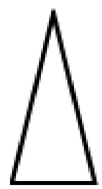


Figure 3.33

Number of sides: . . ..
Length:

- all the same
- 2 the same

none the same
Number of angles:. . . ..
Size of angles:

- all the same
- 2 the same

none the same

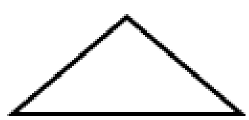


Figure 3.34

Number of sides: . . ..
Length:

- all the same
- 2 the same

none the same

Number of angles:. . . ..

Size of angles:

- all the same
- 2 the same

none the same

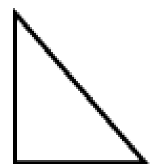


Figure 3.35

Number of sides: . . ..

Length:

- all the same
- 2 the same

none the same

Number of angles:. . .. .

Size of angles:

- all the same
- 2 the same

none the same

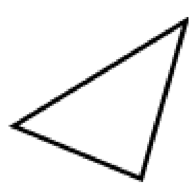


Figure 3.36

Number of sides:. . .. .

Length:

- all the same
- 2 the same

none the same

Figure 3.37

Number of sides: ……….
Length:

- all the same
- 2 the same

none the same
Number of angles:………
Size of angles:

- all the same
- 2 the same

none the same
5.3 Use the squared paper on the rest of this page to make as many triangles with different shapes as you can.

Table 3.16

6. You know a square and a rectangle. Here are some more QUADRILATERALS: You do NOT need to know their names.

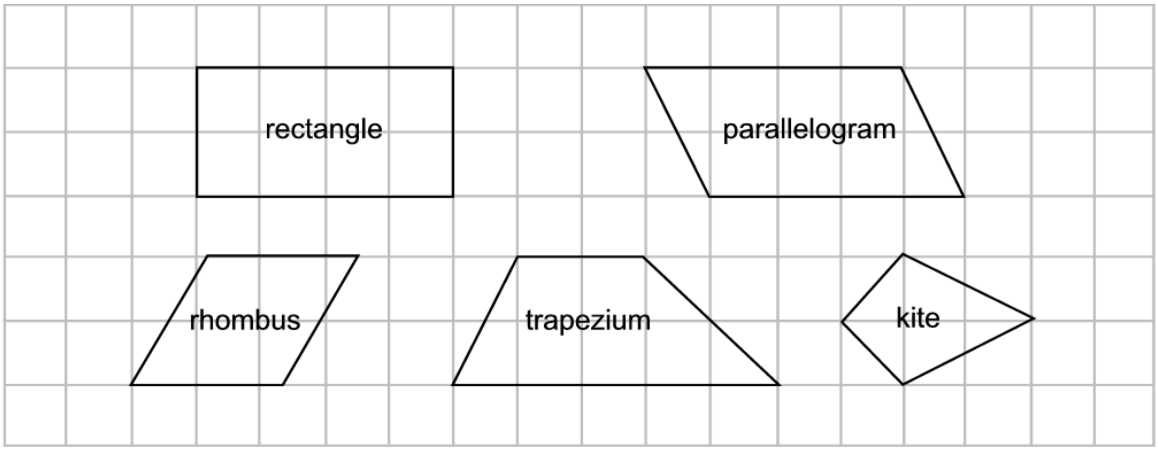


Figure 3.38

6.1 Use the squared paper on the rest of the page to draw as many different quadrilaterals as you can. Begin with a square and a rectangle.

Table 3.17

6.2 Compare their sides and angles and encircle the correct statements.

Shape	Sides	Angles (corners)
Rectangle	Number of sides: ……………Length of sides: • all equal • opposite sides equal • other (explain)	Number of angles: …………....Size of angles: • all equal • opposite angles equal • other (explain)
Square	Number of sides: ……………Length of sides: • all equal • opposite sides equal • other (explain)	Number of angles: …………....Size of angles: • all equal • opposite angles equal • other (explain)
Parallelogram	Number of sides: ……………Length of sides: • all equal • opposite sides equal • other (explain)	Number of angles: …………....Size of angles: • all equal • opposite angles equal • other (explain)

Table 3.18

Shape	Sides	Angles (corners)
Rhombus	Number of sides: ……………Length of sides: • all equal • opposite sides equal • other (explain)	Number of angles: …………....Size of angles: • all equal • opposite angles equal • other (explain)
Trapezium	Number of sides: ……………Length of sides: • all equal • opposite sides equal • other (explain)	Number of angles: …………....Size of angles: • all equal • opposite angles equal • other (explain)

continued on next page

Kite	Number of sides: . . .. .Length of sides: • all equal • opposite sides equal • other (explain)	Number of angles: . . ..Size of angles: • all equal • opposite angles equal • other (explain)

Table 3.19

6.3 Discuss with your friends:
a) Is a square a special rectangle?
b) Is a square a parallelogram?
c) Is a rectangle a parallelogram?
d) What is a quadrilateral?
8. Why is a circle not a polygon?
9. What is the geometrical name for these objects:
9.1

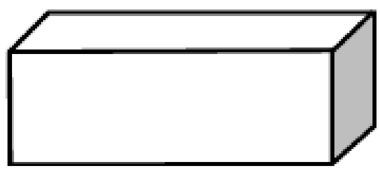


Figure 3.39

9.2

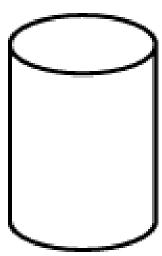


Figure 3.40

9.3 a golf ball
10 How many faces (surfaces) has a cube of sugar?
11. Describe in one word the surface of a sphere.
12. Choose the correct word and underline it: The surface of the sun is curved / flat.
13. How many surfaces has a tetrahedron (3-sided pyramid)?

3.2.6 Assessment

LO 3
space and shape (geometry)The learner will be able to describe and represent characteristics and relationships between two-dimensional shapes and three-dimensional objects in a variety of orientations and positions.
We know this when the learner:
3.1 recognises, visualises and names two-dimensional shapes and three-dimensional objects in the environment including: • rectangular prisms, spheres, cylinders, and other objects; • prisms and pyramids; • circles and rectangles; • polygons in terms of the number of sides up to 8-sided figures;
3.2 describes, sorts and compares two-dimensional shapes and three-dimensional objects from the environment according to geometrical properties including: • shapes of faces; • number of sides; • flat and curved surfaces, straight and curved sides;

Table 3.20

3.2.7 Memorandum

ACTIVITY 1 3D objects

1. Study
2. Drawings; sphere; cube; cylinder; cone; cuboid/ rectangular prism; cuboid; pyramid

3.1 and 3.2

Sphere	Cylinder	Cube	Cuboid	Pyramid	Cone
Orange	Spaghetti	Ice block	Book	Box of chocolates	Ice-cream cone
All balls	Candle	Dice	Brick		Paper hat
	Rake handle		margarine		

Table 3.21

4.1 cuboid
4.2 cylinder
4.3 cone
4.4 cone
4.5 cuboid
5. Table

Object	Number of surfaces	Flat or curved surfaces	Shape of surfaces
Box	6	flat	Rectangle
ball	1	curved	Sphere
cube	6	flat	Square
candle	3	Sides: curved	Cylindrical
pyramid	3 or 4	flat	Sides: triangular;Base: triangular or square

Table 3.22

ACTIVITY 2 2D shapes
1. Polygons: own
2.1 Circles: polygons have straight edges; circles are curved
2.2 It has a curved edge.
3.1 to 3.5 own
4.1 to 4.4 own
5.1 and 5.2

Triangle	Sides	Corners/ Angles
	3all the same	3all the same
	32 the same	32 the same
	32 the same	3 2 the same
	3none the same	3none the same
	3none the same	3 none the same
	3none the same	3none the same

Table 3.23

- Own

- Own

6.3 (a) yes
(b) yes
(c) yes
(d) It is a closed, flat 4-sided figure with straight sides.

3.3 Decimal fractions in the context of measurement[3]

3.3.1 MATHEMATICS

3.3.2 Grade 4

3.3.3 MEASUREMENT, SPACE AND SHAPE

3.3.4 Module 12

3.3.5 DECIMAL FRACTIONS IN THE CONTEXT OF MEASUREMENT

Activity 1:

- To recognise and use decimal fractions in the context of measurement [LO 1.5]
- To estimate, measure, record, compare and order two-dimensional shapes and three-dimensional objects using S.I. units [LO 4.5]
- To estimate, measure, record, compare and order two-dimensional shapes and three-dimensional objects using S.I. units [LO 4.7]

1. Measuring Mass: grams and kilograms: 1 000 g = 1 kg
Hands on: practical work

You may work in pairs or groups for this work. You will need to look at a new box of 100 tea bags and you will need a kitchen scale, one tea bag to work with, a box of cornflakes, a packet of margarine and a brick. You will also need a bathroom scale and a weight-watcher's scale if possible (so work in a group and each one can bring two items of the above).

1.1 Estimate the mass of the box of tea bags. Pass it around the group. Did some clever person look at the outside of the box? Yes, they have to write the MASS on the outside.

1.2 Now pass the box of cornflakes around.

a) What is its mass? .
b) Which is *larger*: a box of tea bags or a box of cornflakes? .
c) Which is *heavier:* a box of tea bags or a box of cornflakes? .
d) Yes, it depends on the size of the box of cornflakes. One can get a box of cornflakes that has the same mass as 100 tea bags.

What would that mass be? .

1.3 Carefully take out one tea bag. Handle it carefully, as it can break easily. Pass it around the group.

a) Estimate the mass of one tea bag. What do you think is its mass, when you
hold it in your hand? .

b) Now discuss in your group: How can you *calculate* the mass of one tea bag, using the information that you have at present? An adult is not to tell you, please!

Hint: Look at the writing on the box. There's something there that can help you.

c) Now use the weight watcher's scale to *measure* the mass of one tea bag. What is it? (It's a small mass, and not so easy to read. Maybe your educator
can help you to read it.)

d) Use the kitchen scale to measure the mass of the box of tea bags and the box of cornflakes. Is the writing on the outside of the boxes accurate?

1.4 Now, carefully, pass the brick around. Estimate the mass of the brick. Complete the table, USING "GRAMS" OR "KILOGRAMS" as necessary. Write in "g" or "kg":

[3]This content is available online at <http://cnx.org/content/m30509/1.1/>.

Object	My estimation	Actual measured mass
1 Tea bag		
Margarine		
Brick		
ME!		

Table 3.24

2. Measuring Length and Distance.
Hands on: practical work

You will need a tape measure, a ruler and any other measuring instruments that you can bring (e.g. tape for measuring "Long Jump". You may work in groups. In each of the following tasks, ESTIMATE the length and write down your estimation BEFORE you actually measure. You may ask a friend to help with the accurate measurement. Write your findings in the table on the next page.

Recordings:

Item	ESTIMATION	Actual Measurement
Round my head		
Round my friend's head		
My foot (length)		
My height (height)		
A very tall person:		
My eye-lash (length)		
My thumb-nail (width)		
My longest finger (length)		

Table 3.25

You probably used millimetres(mm) and centimetres (cm) quite often.
Know this!
10 mm = 1 cm
100 cm = 1 metre
1 000 mm = 1 m
1 000 m = 1 km
2.8 Estimate and then measure each thing listed below, and complete the table below:

Item	ESTIMATION	Actual Measurement
Height of door		
Width of window		
Length of corridor/passage		
Distance to headmaster's office		
Length of rugby field		
Width of soccer field		

Table 3.26

3. Measuring Capacity (best done outside on the sports field).

Hands on: practical work

You will need: a measuring jug (ask Mum); a syringe, but NO needle (ask the vet!); water and red colouring matter that you put in food (ask Mum); an empty cooldrink tin; an empty milk packet; an empty bucket; a teaspoon; your mug/cup; a baby's bath and other empty containers of liquid that you find interesting. You may work in groups. Use the above containers to find out how much liquid each item can hold. ESTIMATE first, write down your estimation and then measure the actual amount.

3.1 Write all your answers in the table below.

Item	ESTIMATION(How much liquid)	Measurement(How much liquid)
The bucket (measure with a litre milk packet)		
The cooldrink tin		
Cooldrink tins in a litre packet		
Liquid in a teaspoon (measure with the syringe)		
Teaspoons in a litre packet		
A baby's bath		
I need, in my bath		
A school swimming pool needs		

Table 3.27

You probably worked with millilitres and litres here.

Know this!

1 000 ml = 1 litre

3.2 Now put two and a half mℓ of (edible) red colouring matter into a glass of water. (Use the teaspoon or syringe). Stir, and admire the result. Taste it. Does *it taste* like cooldrink? Discuss. (Some Foundation Phase learners cannot understand this!)

4. Big pieces, small pieces.

Think carefully and put in the correct sign from >; <; =.

4.1 500 g _ _ _ _ _ _ _ _ _ _ _ _ half a kg.

4.2 62 mm _ _ _ _ _ _ _ _ _ _ _ _62 cm.

4.3 1 850 mm _ _ _ _ _ _ _ _ _ _ _ _ _ _ 2 m.

4.4 1 kℓ _ _ _ _ _ _ _ _ _ _ _ _ _ 900 litres.

4.5 125 mℓ_ 125 litres.

Discuss your answers with a friend or other members of your group. Then try to make up some similar questions to put to the class.

5. Converting units of measurement.

(Think back to Module 2: fractions and decimal fractions).

- Length.

Remember: 100 cm = 1 m

1 000 mm = 1 m

1 000 m = 1 km

Look at the tape measure. Find 25 cm. It looks like quite a long piece (nearly as long as a ruler). But it's only a part of a metre. We need 100 cm to make 1 metre.

So 25 cm = $\frac{25}{100}$ m or (25 ÷ 100) m. Now use a calculator:

25 ÷ 100 =

25 cm =

25 cm are a part (fraction) of a metre.

- Capacity.

Remember: 1 000 mℓ = 1 litre

1 000 litres = 1 kℓ

Look at 750 mℓ of water in a measuring jug. It looks quite a lot, yet it's only a fraction of a litre. We need 100 mℓ to make a litre.

750 mℓ = $\frac{750}{1000}$ litres. Use a calculator if necessary:

750 ÷ 1 000 =

750 mℓ = 0, litres.

- Mass.

Remember: 1 000 mg = 1 g

1 000 g = 1 kg

Hold a kg packet of sugar in your hand.

500 g = 0,_____________kg. Use a calculator if necessary.

- Now write down the missing quantities. Then compare your answers with a friend and if necessary, check on a calculator (using division).

a) 125 mm = 0, __________mm

b) 843 m = 0, __________km

c) 65 litres = 0, ___________kℓ

d) 650 litres = 0, ___________kℓ

e) 450 mg = ______________g

f) 3 845 g = __________kg

5.5 Make up similar questions to put to the class.

Activity 2:

To solve problems using S.I. units [LO 4.6]

1. The following table shows the rainfall at the Helderberg Nature Reserve in 2003. The records in this table are genuine records that are to be found at a real place.

- Study the table and calculate and fill in the total amounts of rain for each month.

Month	Amounts of rain in ml in that month	Total amount of rain in that month
January	17,4	
February		
March	9,2; 9,2; 40,2	
April	6,7; 2,0; 21,0; 0,8	
May		
June	8,0; 4,0; 2,5; 2,5	
July	17,4; 10,5; 16,0; 14,0; 2,5	

Table 3.28

- Check your totals with a friend. Do you agree?
- Can 2,5 ml be fitted into a teaspoon?
- How much liquid does a full teaspoon hold?
- How full is a teaspoon with 2,5 ml of rain in it?
- During which months was there no rain?
- In which rainfall area is this nature reserve: summer rainfall; winter rainfall; all year rainfall? Explain.
- How much rain fell in the Helderberg Nature Reserve during the first six months of 2003?

Write down calculations and answers for the following:

2. At the school Athletics Meeting, in the U/11 Boys Long Jump event, the longest jump of each competitor was recorded as follows:

John 4,4 m
Paul 4,1 m
Garry 4,6 m
Peter 4,0 m
Steve 4,5 m
Tom 3,9 m
David 3,8 m
Colin 3,7 m
Simon 3,5 m

- Who won this event?
- Explain why?

3. A travelling salesman went from Johannesburg to Cape Town, which is approximately 1 442 km; from Cape Town to Windhoek, which is 1 508 km and from Windhoek to Maputo, which is 2409 km and then back to Johannesburg, another 599 km. What was the total distance that he travelled altogether?

4. At the end of a trip the odometer of a car of Easy Hire Car Hire Company shows 3068,4. When the car was hired, it showed 2687,5. What distance did the tourist who hired it travel?

5. In Mother's shopping bag were:

500 g margarine; 1,2 kg mince; one 450 g tin of jam; 10 g yeast and 5 kg flour. What was the total mass of all the shopping that she had to carry home?

Activity 3:

To investigate and approximate perimeter [LO 4.8.1]

A ssignment:

You may do this in a group under the guidance of your educator. You will need a ball of string, four sticks, measuring tapes and a trundle wheel.

1. Go outside onto a playing field if possible, and peg out a suitable hen-run for your five chickens which your grandfather is going to give you. Discuss the size of the run, its shape and position. Write down the measurements that you decide upon.

Length of run: _________ Width of run: __________________ .

2. Then put a stick in the ground at each corner. Tie the end of the string round one stick and unwind the string along the edge of your hen-run, going round each stick until you get back to where you started. Cut the string and tie it to the stick. Your string marks where you want to put a fence.

3. Measure how much string you used and write it down.

4. Return to your classroom. Draw a diagram of this hen-run on a clean page. Give your diagram a heading and write down the length and the width on your diagram.

5. Calculate how much wire-netting you will need to go right round the hen-run. (You do not need a gate; you can step over.)

6. Challenge: Make a model of your hen-run. You may even make it to scale. Ask your educator to help you. (Use a simple scale, e.g. 1 cm =1 m).

TEST YOUR PROGRESS

1. Complete the following:

- 6 578 g = _____________kg
- 5,703 km = ________________ m
- 6 712 ml = ________________litres
- 7 68 mm = _________________ m
- 34 mm = __________________________m (5)

Solve the following sums and write down all the steps of your calculations:

2. 87 mm + 4 568 mm + 1,250 m (answer in metres)

3. An ant runs round the edge of a book that is 15 cm wide and 21,5 cm long. How far does the ant run?

4. Peter drinks 250 ml of water after a tennis match and then the coach gives him 350 ml of orange juice. How much liquid does he drink altogether?

5. The mass of a van is 2 250 kg when it is empty. Sixteen bags of oranges each with a mass of 15 kg are loaded onto the van. What is the mass of the van and its load together? (4)

6. Mother has 5 kg of flour. She uses three and a half kg of it. How much flour is left? (2)

3.3.6 Assessment

LO 4
measurementThe learner will be able to use appropriate measuring units, instruments and formulae in a variety of contexts.
We know this when the learner:
4.1 reads, tells and writes analogue, digital and 24-hour time to at least the nearest minute and second;
4.2 solves problems involving calculation and conversion between appropriate time units including seconds, minutes, hours, days, weeks, months and years;
continued on next page

4.3 uses time-measuring instruments to appropriate levels of precision, including watches and clocks;
4.4 describes and illustrates ways of measuring and representing time in different cultures throughout history;
4.5 estimates, measures, records, compares and orders two-dimensional shapes and three-dimensional objects using S.I. units with appropriate precision for: • mass using grams (g) and kilograms (kg); • capacity using millilitres (ml) and litres (l); • length using millimetres (mm), centimetres (cm), metres (m) and kilometres (km);
4.6 solves problems involving selecting, calculating with and converting between appropriate S.I. units listed above, integrating appropriate context for Technology and Natural Sciences;
4.7 uses appropriate measuring instruments (with understanding of their limitations) to appropriate levels of precision including: • bathroom scales, kitchen scales and balances to measure mass; • measuring jugs to measure capacity; • rulers, metre sticks, tape measures and trundle wheels to measure length;
4.8 investigates and approximates (alone and/or as a member of a group or team): • perimeter, using rulers or measuring tapes.

Table 3.29

3.3.7 Memorandum

ACTIVITY 1 measuring

1. Mass

1.1 500 g (or other sizes)
1.2 (a) 500 g; (b) cornflakes; (c) depends on size; (d) 250 g
1.3 (a) own; (b) own (2,5 g); (c) 2,5 g; (d) own
1.4

Object	My estimation	Actual measured mass
Tea-bag	own	2,5 g
Margarine	own	500g (or other)
Brick	own	About 3 kg
Me	own	Own

Table 3.30

2. Length and Distance
2.1 to 2.7 Recordings:

Item	Estimation	Actual Measurement
Head	own	Own
Friend's head	"	"
Foot	"	"
Height	"	"
Tall person: height	"	"
Eye-lash	"	"
Thumb-nail: width	"	"
Longest finger: length	"	"

Table 3.31

2.8

Item	Estimation	Actual Measurement
Height of door	own	2m
Width of window	"	They vary
Length of corridor	"	"
Distance to Office	"	"
Length of rugby-field	"	"
Width of soccer-field	"	"

Table 3.32

(The size of school sports-fields are smaller than ones for adults.)
3. Measuring Capacity

Item	Estimation	Actual Measurement
Bucket	own	Usually 5 or 10 or 15
Cool drink tin	"	Depends on size of tin
Cool drink tins in a litre packet	"	"
Tea-spoon	"	5 ml
Tea-spoons in a titre packet	"	200
Baby's bath	"	Depends
My bath	"	"
School swimming-pool	"	"

Table 3.33

Pools differ in size

- Practical (colouring matter does not give flavour)

ACTIVITY 2 problems using S.I. units
1.1

Month	Rainfall in ml that month	Total for that month
January		17,4
February		
March		58,6
April		30,5
May		
June		17,0
July		60,4

Table 3.34

1.2 oral
1.3 yes
1.4 5 ml
1.5 half
1.6 February and May
1.7 autumn according to these figures – 89,1ml then; 77,4ml in winter so far, but the rainfall for August has not been included. (It is actually a winter rainfall area.)
1.8 123,5 ml
2.1 Gary 2.2 4,6 m is the longest jump.
3. 5 958 km
4. 380,9 km
5. 7,17 kg
ACTIVITY 3 perimeter – practical investigation
1 to 6 Own practical measurement and recording
TEST YOUR PROGRESS
1.1 6,578 kg
1.2 5 703 m
1.3 6,712 liter
1.4 0,768 m
1.5 3,4 cm
1. 5,905 m
2. 73 cm
3. 600 ml
4. 2 490 kg
5. 1,5 kg

Chapter 4

Term 4

4.1 Investigate and compare 2-dimensional shapes[1]

4.1.1 MATHEMATICS

4.1.2 Grade 4

4.1.3 SPACE AND SHAPE, PATTERNS, DATA HANDLING

4.1.4 Module 13

4.1.5 investigate and compare two-dimensional shapes

Activity:

- To investigate and compare two-dimensional shapes by making them and drawing them on a grid [LO 3.3]
- To make two-dimensional shapes with a focus on tessellation [LO 3.5]

HANDS ON: PRACTICAL WORK.

You may work in pairs or in small groups. Use an old cornflake box (or other box) to make strips of cardboard. They must be wide enough for you to be able to punch a hole at both ends. Punch a hole at each end of each strip. Keep all your strips in an old envelope and bring them to the lesson. Also bring a packet of split pins to the lesson.

MAKING 2-DIMENSIONAL SHAPES: revision of properties and to test rigidity.

1. Each group/pair of learners must complete the following and record their findings on the dotted lines provided.

1.1 Triangles.

a) Make a three-sided figure by joining the ends of three strips of equal length by using split pins. Place your triangle on a table or on the floor and hold the corners. Is it possible to change the shape of the figure by pulling the corners (gently)?

b) Make another 3-sided shape with two strips of equal length and one strip of a different length. Pin it with the split pins. Again, place it on the table, hold the corners and try to change the shape by pulling one or more corners. Can the shape be changed?

c) Now make a 3-sided shape with three strips of different lengths. Pin it and place it on the table. Gently try to change its shape by pulling the corners. Can the shape be changed?

[1] This content is available online at <http://cnx.org/content/m30563/1.1/>.

d) Pin two short strips of different lengths and make a square corner with them. Use them and one more strip to make a 3-sided shape with one square corner. (If you need to cut the third side to do this, do so.) Once you have pinned it, can the shape be changed?

1.2 Your group should now have four triangles, all of different shapes, but all with three sides. Use them to decorate the walls of your classroom. Make a neat, large label: TRIANGLES.

- How many sides does any triangle have?
- Are the sides straight or curved?
- Is a triangle *rigid*, or *can its shape be changed* by pulling the corners?

- A shape that cannot be changed is said to be rigid. This is why triangles are used in the construction of the frame on which the roof of a house is built. A triangle is strong. Triangles may also be seen in the steel framework of bridges.

Any triangle has three straight sides and is rigid.

2. Quadrilaterals.

2.1 Use four strips of equal length to pin a 4-sided shape. Can it be moved to have square corners and be a square?

2.2 Can the corners be pulled so that they are not square corners, but the shape is still a 4-sided shape with all the sides equal in length?

2.3 Use two long strips and two short strips and see what different quadrilaterals you can make. See if each shape can be changed by gently pulling the corners. Your shapes should include the following shapes:

Figure 4.1

a) the _________________________

Figure 4.2

b) a parallelogram

Figure 4.3

c) the trapezium

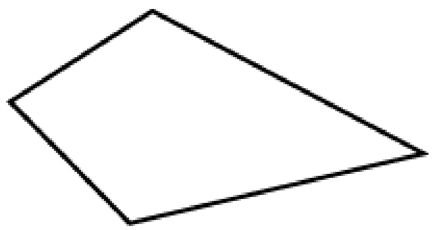


Figure 4.4

d) the _____________________

Try to make other shapes with four sides. All the sides may be of different length if you wish.

2.4 Can the 4-sided shapes be changed if you pull the corners gently?

2.5 How could you prevent this change from being possible?

Quadrilaterals have four straight sides and are not rigid.

3. Individual work. Use the shapes on the next page, your pencil and ruler, and a pair of scissors to do the following:

3.1 Turn each triangle into a 6-sided shape (hexagon) by cutting off the corners. Cut out your hexagons and paste them in the frame below. (They need not be regular hexagons; the sides may differ in length, but there must be six sides.)

3.2 Turn each quadrilateral into an 8-sided shape (octagon) by cutting off the corners. (They need not be regular octagons; the sides may differ in length, but there must be eight sides.) Cut out your octagons and paste them in the frame below.

Shapes for cutting out

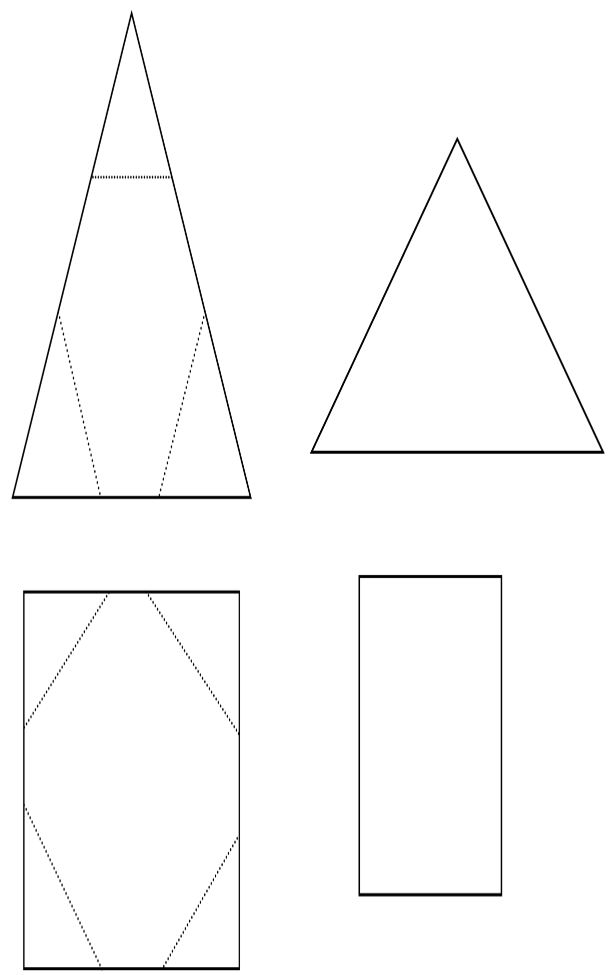


Figure 4.5

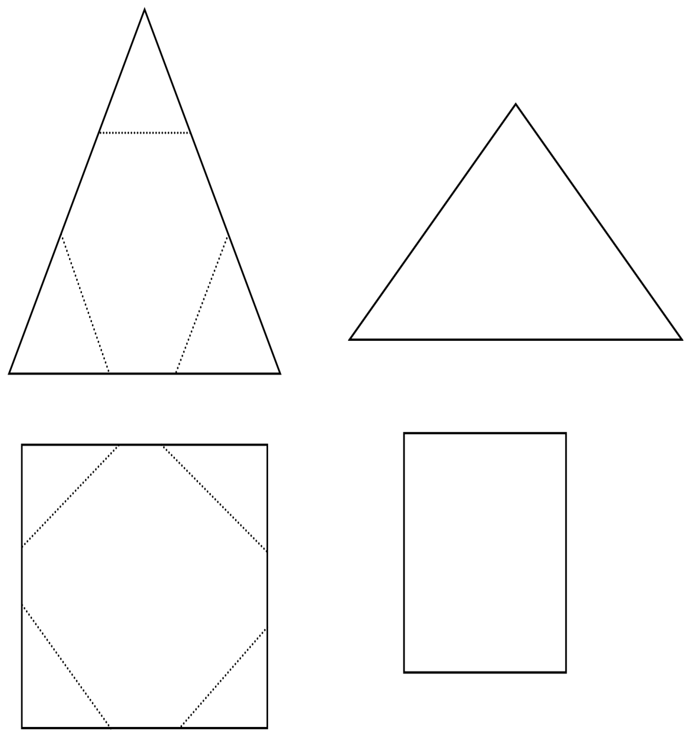


Figure 4.6

Not for cutting out
The convex pentagon – (the points are all "outwards").

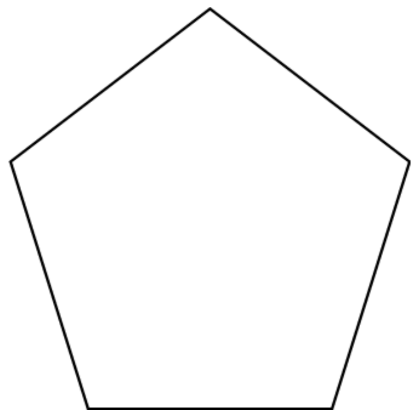


Figure 4.7

The convex pentagon – (the points are all "outwards").
Concave shapes look like this:

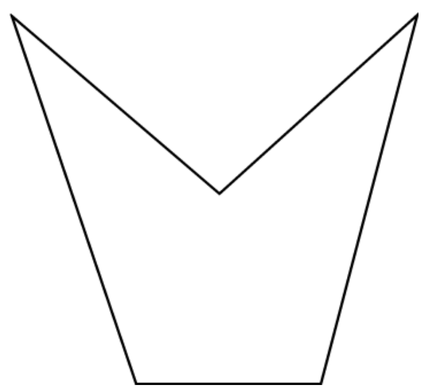


Figure 4.8

The concave pentagon – there are still five sides but one point "goes inwards".

4. Individual work: Use the grid paper on the rest of this page to make one of each of the following shapes and colour it in:

- triangle
- quadrilateral
- pentagon
- hexagon – 6 sides
- heptagon – 7 sides
- octagon

(They do not have to be regular; the sides may be of different lengths.)

Table 4.1

5. On the dotted paper below:

- Draw a triangle by joining six dots.
- Imagine that your triangle is a floor tile. Try to cover the paper inside the frame with identical triangles to the one you have drawn. No spaces must be left and there must be no overlapping. You may, however, flip your triangle over.

Example:

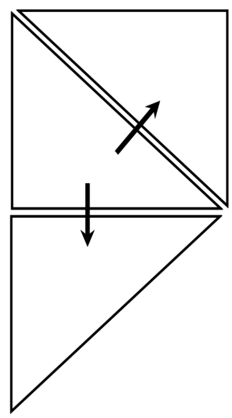


Figure 4.9

Here a space has been left to show you a flip. Remember that when you do it, no spaces may be left.
My tessellation with triangles:

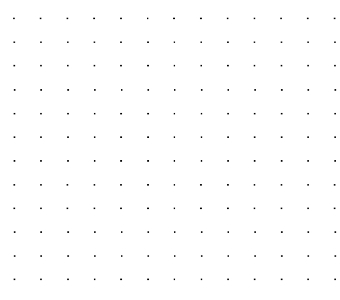


Figure 4.10

5.3 Tessellate with a different triangle:

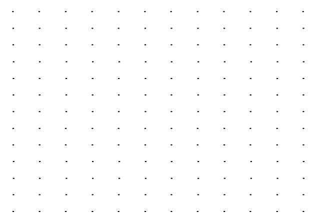


Figure 4.11

5.4 Imagine that your rectangle is a floor tile. Try to cover the paper inside the frame with identical rectangles to the one you have drawn. No spaces must be left and there must be no overlapping. You may, however, flip your rectangle over.

My tessellation with rectangles:

Figure 4.12

5.5 Tessellate with squares:

Figure 4.13

5.6 Tessellate with other quadrilaterals, e.g. kites or parallelograms:

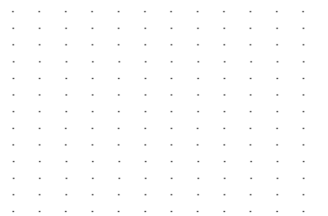


Figure 4.14

5.7 Use the grid paper on the next page to see what other polygons can be used to cover the floor without leaving spaces and without overlapping, e.g. regular pentagons; regular hexagons; regular octagons.

GRID PAPER (square blocks) for TESSELLATION

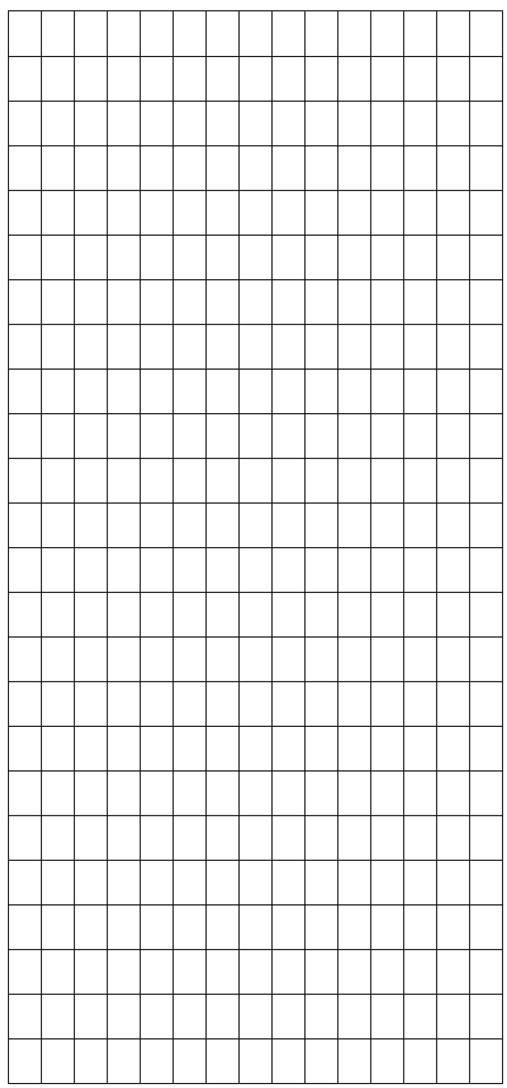


Table 4.2

5.8 ARE THESE EXAMPLES OF TESSELLATION:
Write yes or no and then explain why you said that.

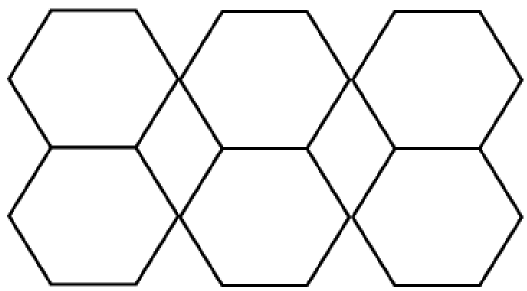


Figure 4.15

a)______ Explain your answer _____________

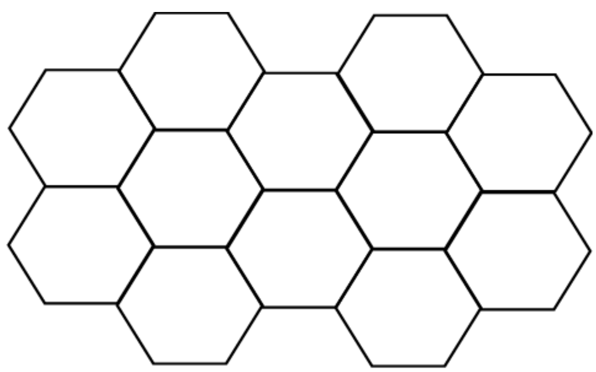


Figure 4.16

b)_________ Explain your answer __________________

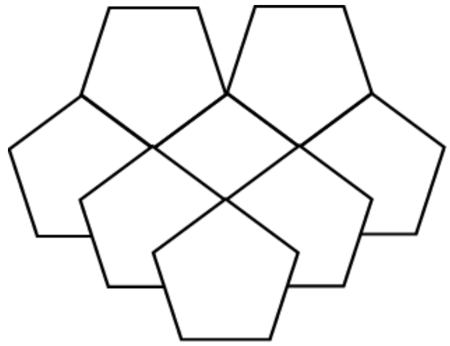


Figure 4.17

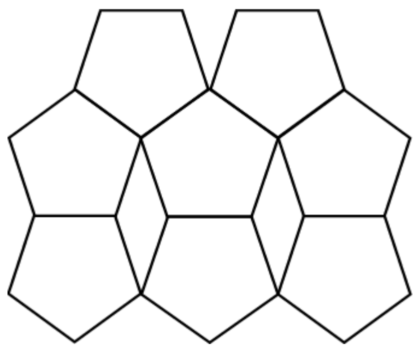


Figure 4.18

c)___________ Explain your answer _____________

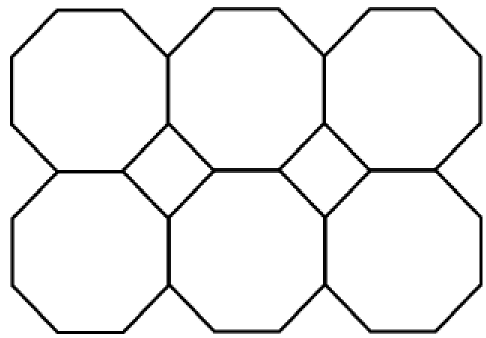


Figure 4.19

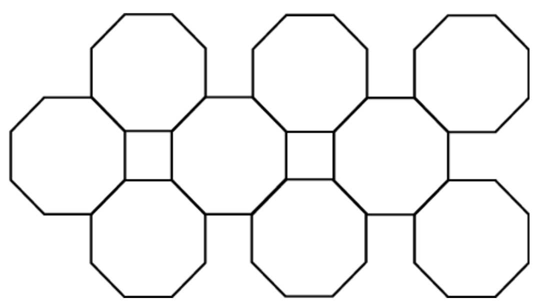


Figure 4.20

d)___________ Explain your answer ______________

4.1.6 Assessment

LO 3
Space and Shape (Geometry) The learner will be able to describe and represent characteristics and relationships between two-dimensional shapes and three-dimensional objects in a variety of orientations and positions.
continued on next page

We know this when the learner:
3.2 describes, sorts and compares two-dimensional shapes and three-dimensional objects from the environment according to geometrical properties including: • shapes of faces; • number of sides; • flat and curved surfaces, straight and curved sides.
3.3 investigates and compares (alone and/or as a member of a group or team) two-dimensional shapes and three dimensional objects studied in this grade according to the properties already studied, by:
3.3.1 making three-dimensional models using cut-out polygons (supplied);
• drawing shapes on grid paper;
3.4 recognises and describes lines of symmetry in two-dimensional shapes, including those in nature and its cultural art forms;
3.5 makes two-dimensional shapes, three-dimensional objects and patterns from geometric objects and shapes (e.g. tangrams) with a focus on tiling (tessellation) and line symmetry;
3.6 recognises and describes natural and cultural two-dimensional shapes, three-dimensional objects and patterns in terms of geometric properties;
3.7 describes changes in the view of an object held in different positions.

Table 4.3

4.1.7 Memorandum

ACTIVITY: comparing 2D shapes

- Triangles

(a) No
(b) No
(c) No
(d) No
1.2 Practical
1.3 3
1.4 straight
1.5 rigid
2. Quadrilaterals
2.1 yes
2.2 yes
2.3 (a) rectangle
(d) kite
2.4 yes
2.5 Add one diagonal (join one pair of opposite angles with a strip, cut the right length, and split pins.)
3.1 Practical: cutting and pasting
3.2 Practical: cutting and pasting
4.1 to 4.6 Own work on grid paper.

5.1 to 5.6 Own work on dotted paper.

5.7 Own tessellation on grid paper

5.8 (a) No; there are spaces between the hexagons but

Yes, if two shapes are allowed; the hexagons and diamonds cover the area.

(b) Yes; the shape covers the area

(c) No; in the first diagram there are spaces; in the second, there is over-lapping.

(d) and (e) Yes if two shapes are allowed. In this case the octagon and squares cover the area; octagons on their own cannot be placed to cover the area.

4.2 Investigate and approximate the area of polygons[2]

4.2.1 MATHEMATICS

4.2.2 Grade 4

4.2.3 SPACE AND SHAPE, PATTERNS, DATA HANDLING

4.2.4 Module 14

4.2.5 INVESTIGATE AND APPROXIMATE THE AREA OF POLYGONS

Activity 1:

To investigate and approximate the area of polygons (using square grids and tiling) in order to develop an understanding of square units [LO 4.8]

- You know that when we tessellate, a flat space is completely covered without any overlapping and without spaces being left.

1. Square blocks covered by your hand.

1.1 On the grid paper below, carefully place your hand with the fingers spread out. Trace around your hand with your pencil, stopping at the wrist. Lift your hand. You will see a beautiful outline of your hand. We want to find out how many square blocks your hand covers.

1.2 Put a dot in each full block as you count it, and write down the total number of full blocks covered by your hand in the table on the next page. Now look for places where half a block is covered. Two half blocks will make a whole block, so put a dot in each and count them as one whole block. Write down the total. Now combine those less than a half with those more than a half to make more wholes. Write down that total. Now add the totals. That should give you an approximate idea of how many blocks are covered by your hand.

[2] This content is available online at <http://cnx.org/content/m30566/1.1/>.

Table 4.4

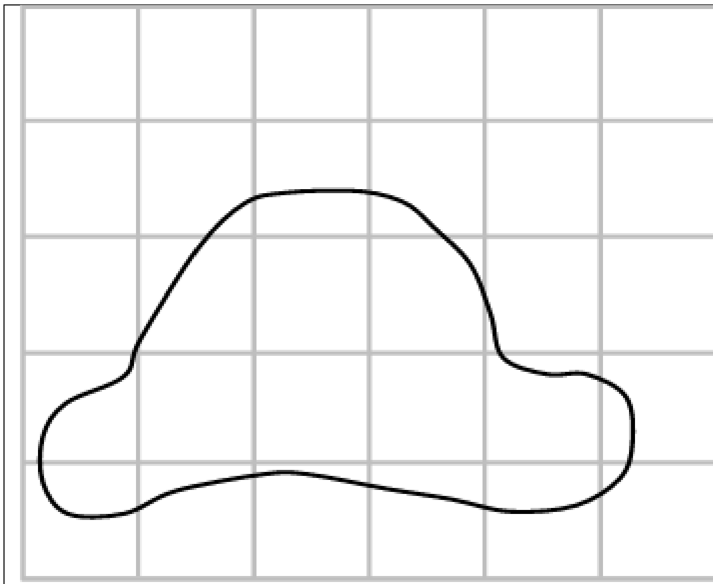
Square blocks covered by my hand.

Whole Blocks	Half blocks made into whole blocks	Other bits made into whole blocks	Total number of blocks covered by my hand.

Table 4.5

1.3 Now colour in the shape of your hand on the paper.

2. Count the square blocks covered by the following shape in the same way. First count the whole blocks. Then combine bits to make whole blocks. (Put dots in the blocks as you count them, if it helps.)



Total number of blocks covered: …………………….. square blocks.

Table 4.6

3. Count the blocks covered by the following polygons:

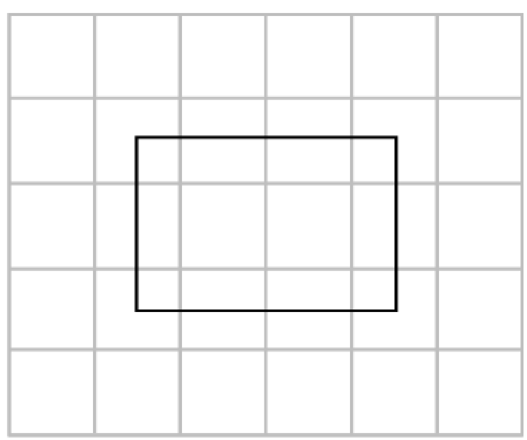


Figure 4.21

3. 1 __________ square blocks

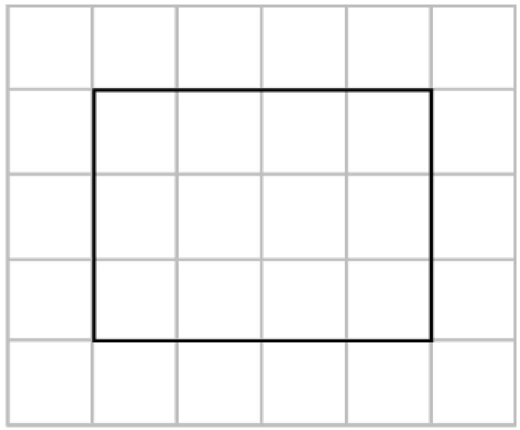


Figure 4.22

3.2 ________________square blocks

Measure the square blocks with your ruler. They are 1 cm long and 1 cm wide, so instead of calling them "square blocks", we can call them SQUARE CENTIMETRES.

4. Now find the number of square centimetres covered by each of the following polygons:

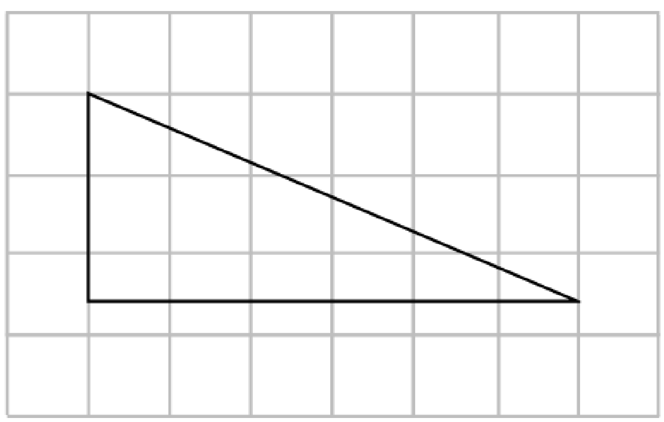


Figure 4.23

4.1______________ square cm

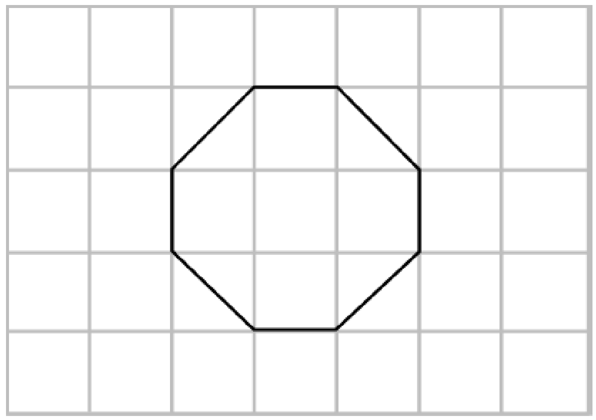


Figure 4.24

4.2_________________ square cm

5. Let's pretend that you have made a doll's house for a younger cousin. You have covered the floor of the bathroom with paper on which you have drawn 1 cm square blocks. There is a bath mat on the floor as shown below. How many of the tiles are covered by the bath mat?

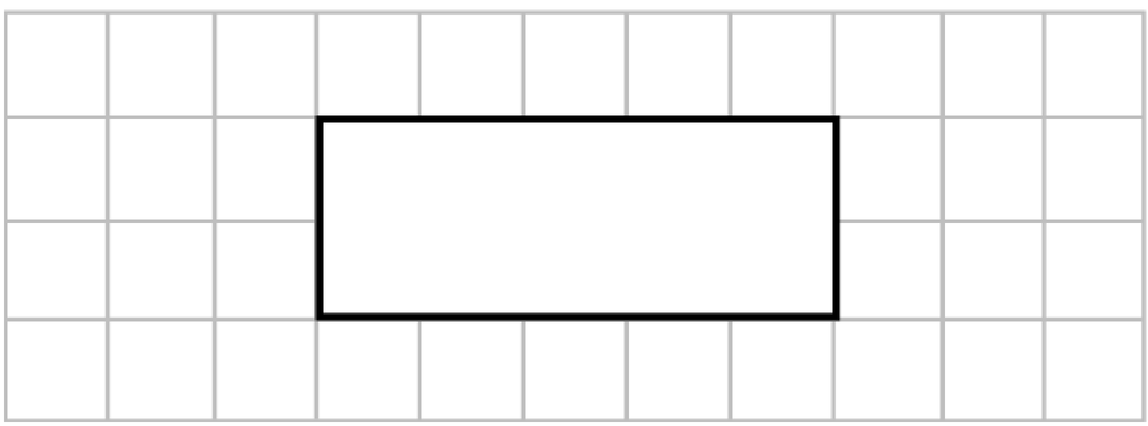


Figure 4.25

- Explain to a friend how you calculated your answer.
- Write down how you calculated your answer. Also write down your answer. Remember to write "square cm" with your answer. 6. In the family room there is a mat that is 4 m long and 3 m wide.

6.1 Draw a diagram to show what the mat looks like and label the length and the width.

6.2 Calculate how many square metres of floor are covered by the mat. Write down your calculation and the answer. Remember to write "square metres" with the answer.

6.3 Now draw blocks on your diagram so that it is four blocks long and three blocks wide. Check your answer for 6.2.

7. Dad uses 36 square tiles to tile the floor of a square braai area. He starts to tile the floor by placing 6 tiles next to each other along the edge of this floor.

7.1 How many rows of six tiles each will he have when he has finished?

7.2 Draw a diagram to show what it looks like.

8.

- Can one make a square tiled area with 25 square tiles?

8.2 Make a diagram to show what it would look like.

9. Dad uses 736 tiles to tile a rectangular stoep. There are 23 tiles across the width of the stoep. How many tiles are there down the length of this stoep? Write down your calculation and answer.

10. Little 1 cm square tiles that look like Tiger's eye semi-precious stones are used to cover a work surface in the kitchen. There are 75 of these tiles along the length of this surface, and 54 tiles across its width. How many tiles are there altogether?

Activity 2:

To investigate and extend numeric and geometric patterns not limited to sequences involving constant difference or ratio [LO 2.1]

1.1

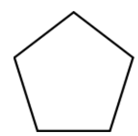


Figure 4.26

1.2

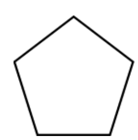


Figure 4.27

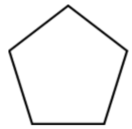


Figure 4.28

1.3

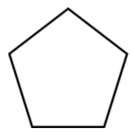


Figure 4.29

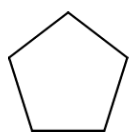


Figure 4.30

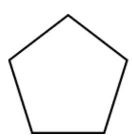


Figure 4.31

1.4

1. Look at the following shapes (which can be made with cuisenaire rods or toothpicks) and write down your answers:

There is a very obvious pattern. Predict what 1.4 will be.

That pattern is so easy because each time the pattern changes in the same way.

Spotting a pattern can save us time and energy when we calculate answers.

2. Now look at the multiples of 9 again. We have already noticed one pattern. Maybe you noticed another? 9; 18; 27; 36; …..

Add the digits that make each multiple: 0 + 9 =____; 1 + 8 =____; 2 + 7 =____; 3 + 6 = ____

Is this true of all the multiples of 9? Try a few more. It can be useful if you are not sure of a multiple. Some learners are not sure if 54 or 56 is a multiple of 9. Which is it? ____

John knows seventy something is a multiple of 9. Help him: seventy-___ All John has to do is to say: 7 + ___ = 9; the multiple is 72.

3. Complete the table by discovering and using the pattern:

3.1

Input	1	2	3	4	5	6	7	10	13
Output	7	14	21	28					

Table 4.7

3.2 This information could also be given in a flow diagram. Please complete the flow diagram by looking at 4.1 again:

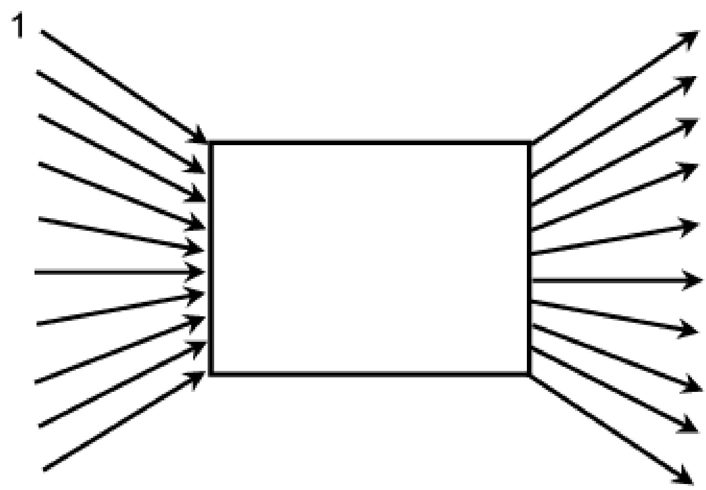


Figure 4.32

3.3 Write in words what was done: The input number was_____________

4.

4.1 Complete the table and then describe to your friends what was done:

1	2	3	4	7	8	9	10	20	50
7	12	17	22						

Table 4.8

4.2 Put the **same** information from 5.1 in a flow diagram:

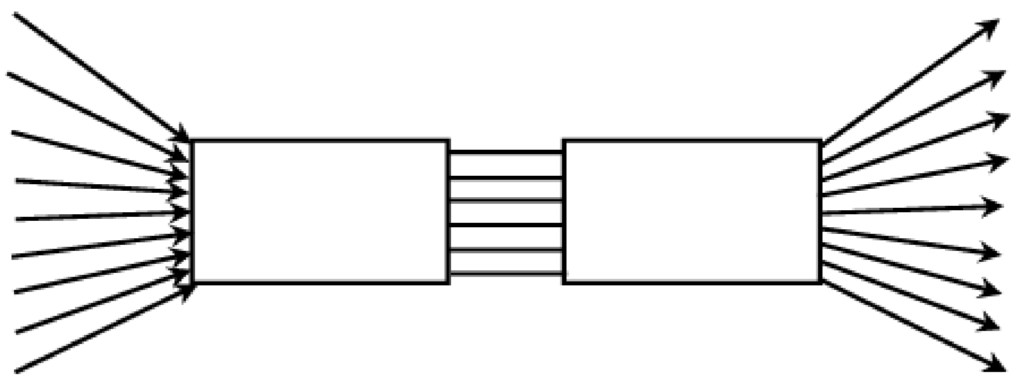


Figure 4.33

4.3 Write down in words what was done: The input number was ______
5.
5.1 Now find the “recipe” and complete this table:

1	2	3	4	5	6	9	11	12	20
3	5	7	9	11					

Table 4.9

- Write down in words what was done: The input number was _________

5.3 Now find the “recipe” to complete this table:

In	1	2	3	4	5	6	7	10	14
Out	3	7	11	15					

Table 4.10

- Write down in words what was done: The input number was ________

5.5 Why cannot this table in 6.3 be written in a flow diagram? Discuss this with your friends and then write down your answer.

6. Other patterns involving numbers:

6.1 Add: $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10$

One can just add them in that order, or one can look for patterns. Just as we paired the numbers on opposite sides of the dice, so let us pair opposite numbers here: the first and the last and so on. It becomes:

1 + 10 and 2 + 9 and 3 + 8 and 4 + 7 and 5 + 6. What do you notice about the totals?
_______ This can be shortened to: 5 × 11. Explain this to a friend. Where does 5 × 11 come from?
6.2 Add all the numbers from 1 to 20 inclusive. Look for a pattern and a short way. Write down what you did and your answer on the dotted line below. Then check your answer the long way. You may use a calculator to do so.
7. Another interesting pattern can be seen in the answers if you add:

- 1 to 10 inclusive = _____
- 11 to 20 inclusive = _____
- 21 to 30 inclusive = _____
- 31 to 40 inclusive = _____
- 41 to 50 inclusive, and so on to 100. Write down the answers, study them and try to explain why this pattern occurs.

8. More patterns with shapes. The following pattern may be made with toothpicks, one for each straight line.

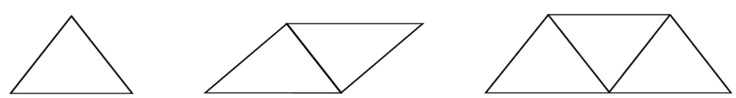


Figure 4.34

- Pattern: Each time we add one triangle, we need ______more toothpicks.
- We could put our information into a table. Please complete it.

Number of triangles	1	2	3	4	5	6	17	25
Number of toothpicks								

Table 4.11

- How are the last two answers calculated? There are at least two different ways (without a calculator) and it is important that you should discuss these with your friends.

Hint: Maybe you could look at the toothpicks needed for six triangles and use them to calculate how many toothpicks are needed for 17 triangles, or you could think that you know the general pattern and just apply it to find out how many toothpicks are needed for 17 triangles. Your discussion is important, so the answers are not being given to you.The same applies to the 25 triangles.
8.4 Write down how you calculated the answers for

a) 17 triangles
b) 25 triangles

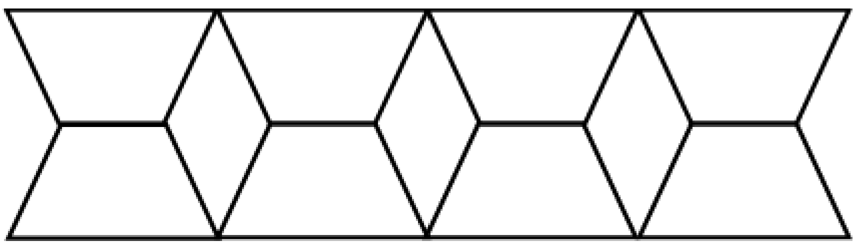
9. Complete the table:

In	1	2	3	4	5	6	10	20	50
Out	8	15	22	29	36				

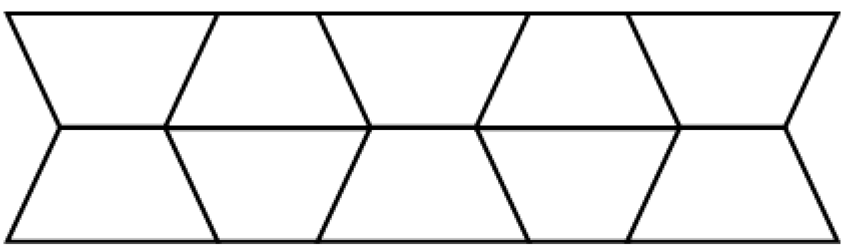
Table 4.12

TEST YOUR PROGRESS

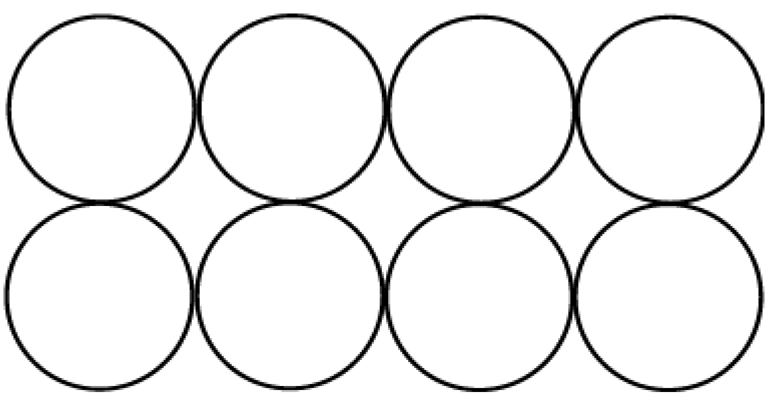
1. Do the following show tessellation? Write “yes” or “no” for each one.



- Using the trapezium and diamond _ _ _ _ _ _ _ _



- Using just the trapezium _ _ _ _ _ _ _ _



continued on next page

• Using circles _ _ _ _ _ _ _

Table 4.13

2. Write down one way in which the sides of a trapezium differ from the sides of a parallelogram .
3. Why is the triangle used in the building of the framework of the roofs of houses?
4. On a floor there are 10 tiles in a row and there are 17 rows of tiles. How many tiles are there altogether?
5. Dad uses 135 tiles to tile a stoep. He places 9 tiles across the width of the stoep. How many tiles are there in the length of the stoep?
6. Make a diagram to show what a square tiled area would look like if 16 square tiles were used to cover it. Use your ruler to draw in the tiles.
7. Complete the table:

1	2	3	4	5	6	10	12	20
4	7	10	13	16				

Table 4.14

8. Complete this table:

1	2	3	4	7	8	
1	4	9	16			100

Table 4.15

9. Thirty squares are made with toothpicks as shown in the diagram (one toothpick for each straight line). How many toothpicks are needed?

1. Find a pattern and write down the missing numbers: 5; 13; 21; 29; _ _ _;_ _ _

4.2.6 Assessment

Learning outcomes(LOs)
LO 2
Patterns, Functions and AlgebraThe learner will be able to recognise, describe and represent patterns and relationships, as well as to solve problems using algebraic language and skills.
continued on next page

Assessment standards(ASs)
We know this when the learner:
2.1 investigates and extends numeric and geometric patterns looking for a relationship or rules, including patterns:
• represented in physical or diagrammatic form;
2.1.2 not limited to sequences involving constant difference or ratio.
2.2 describes observed relationships or rules in own words.
LO 4
measurementThe learner will be able to use appropriate measuring units, instruments and formulae in a variety of contexts.
We know this when the learner:
4.8 investigates and approximates (alone and /or as a member of a group or team):
4.8.2 area of polygons (using square grids and tiling) in order to develop an understanding of square units; • volume/capacity of three-dimensional objects (by packing or filling them) in order to develop an understanding of cubic units.

Table 4.16

4.2.7 Memorandum

ACTIVITY 1area of polygons

1.1 to 1.3 Practical own work and recording of it.
2. 4 whole blocks and 5 and a bit blocks = about 9 blocks
3.1 6
3.2 12

- about 8 square cm
- 7 square cm

- counted the length on the long side and the number of tiles on the short side.
- 5 x 2 = 10 tiles or 10 square cm

- Drawing
- 4m x 3m = 12 square metres
- Drawing

- 6 rows
- Drawing

8.1 Yes
8.2 Drawing
9. 23 x ? =736
32 tiles
10. 75 x 54 = 4 050 tiles!
ACTIVITY 2 Patterns
1.4
4 shapes
2. Multiples of 9 – the digits forming each multiple of 9 add up to 9, so 54 is a multiple of 9; 72 is a multiple of 9. This is useful for checking answers.

- Missing output numbers: 35; 42; 49; 70; 91
- Flow diagram: input numbers: 1; 2; 3; 4; 5; 6; 7; 8; 9; 10 Operator: x 7

Output numbers: 7; 14; 21; 28; 35; 42; 49; 56; 63; 70

- multiplied by 7

4.1

1	2	3	4	7	8	9	10	20	50
7	12	17	22	37	42	47	52	102	252

Table 4.17

4.2 Flow diagram:
Input numbers: 1; 2; 3; 4; 7; 8; 9; 10; 20; 50
Operators: x 5 + 2
Output numbers: 7; 12; 17; 22; 37; 42; 47; 52; 102; 252
4.3 multiplied by 5 and 2 was added to the answer.
5.1

1	2	3	4	5	6	9	11	12	20
3	5	7	9	11	13	19	23	25	41

Table 4.18

5.2 multiplied by 2 and 1 was added to the answer
5.3

In	1	2	3	4	5	6	7	10	14
Out	3	7	11	15	19	23	27	39	55

Table 4.19

5.3 multiplied by 4 and 1 was subtracted from the answer.

- It can! x 4 – 1

- Own

6.2 1 + 20; 2 + 19; 3 + 18; 4 + 17; 5 + 16; 6 + 15; 7 + 14; 8 + 13; 9 + 12; 10 + 11
10 x 21 = 210
7. 55; 155; 255; 355; 455 etc.
Own
8.1 2
8.2

Triangles	1	2	3	4	5	6	17	25
Tooth-picks	3	5	7	9	11	13	35	51

Table 4.20

- Discussion

8.4 (a) 17 x 2 + 1
(b) 25 x 2 + 1
9.

In	1	2	3	4	5	6	10	20	50
Out	8	15	22	29	36	43	71	141	351

Table 4.21

4.2.7.1 TEST YOUR PROGRESS

1.1 Yes
1.2 Yes
1.3 No
2. Only 1 pair of opposite sides are parallel; they are not equal in length.
3. It is a rigid shape.
4. 170 tiles
5. 15 tiles
6. Diagram 4 by 4
7.

1	2	3	4	5	6	10	12	20
4	7	10	13	16	19	31	37	61

Table 4.22

8.

1	2	3	4	7	8	10
1	4	9	16	49	64	100

Table 4.23

10. 5; 13; 21; 29; 37; 45

4.3 Three-dimensional objects from the environment[3]

4.3.1 MATHEMATICS

4.3.2 Grade 4

4.3.3 SPACE AND SHAPE, PATTERNS, DATA HANDLING

4.3.4 Module 15

4.3.5 THREE-DIMENSIONAL OBJECTS FROM THE ENVIRONMENT

Activity 1:

To investigate and compare three-dimensional objects from the environment according to geometrical properties by making three-dimensional models using cut-out polygons

[LO 2.1, 3.2, 3.4, 3.5, 4.8]

1. Investigating nets: boxes.

You need a cornflake box, a box that contained tea and other boxes. Carefully open the boxes where they were glued so that they can be laid flat on the table. Examine the plan or net of the box.

2. Before you cut out the net below, fill in the dots for a dice on each face. Then cut out the net, fold it into a cube and stick it with sticky tape. Look at a real dice to see if your numbers are correct.

Table 4.24

3. Cut out the shape below the table and fold it into a tetrahedron (a pyramid) with three sides and a triangular base.

4. Now use the net of the cornflake box (rectangular prism), the cube that you have cut out and the tetrahedron to complete the table:

Object	Number of surfaces	Flat or curved surfaces (faces)	Number of corners (vertices)	Number of edges
Rectangular prism				
Cube				
Tetrahedron				

Table 4.25

[3] This content is available online at <http://cnx.org/content/m30614/1.1/>.

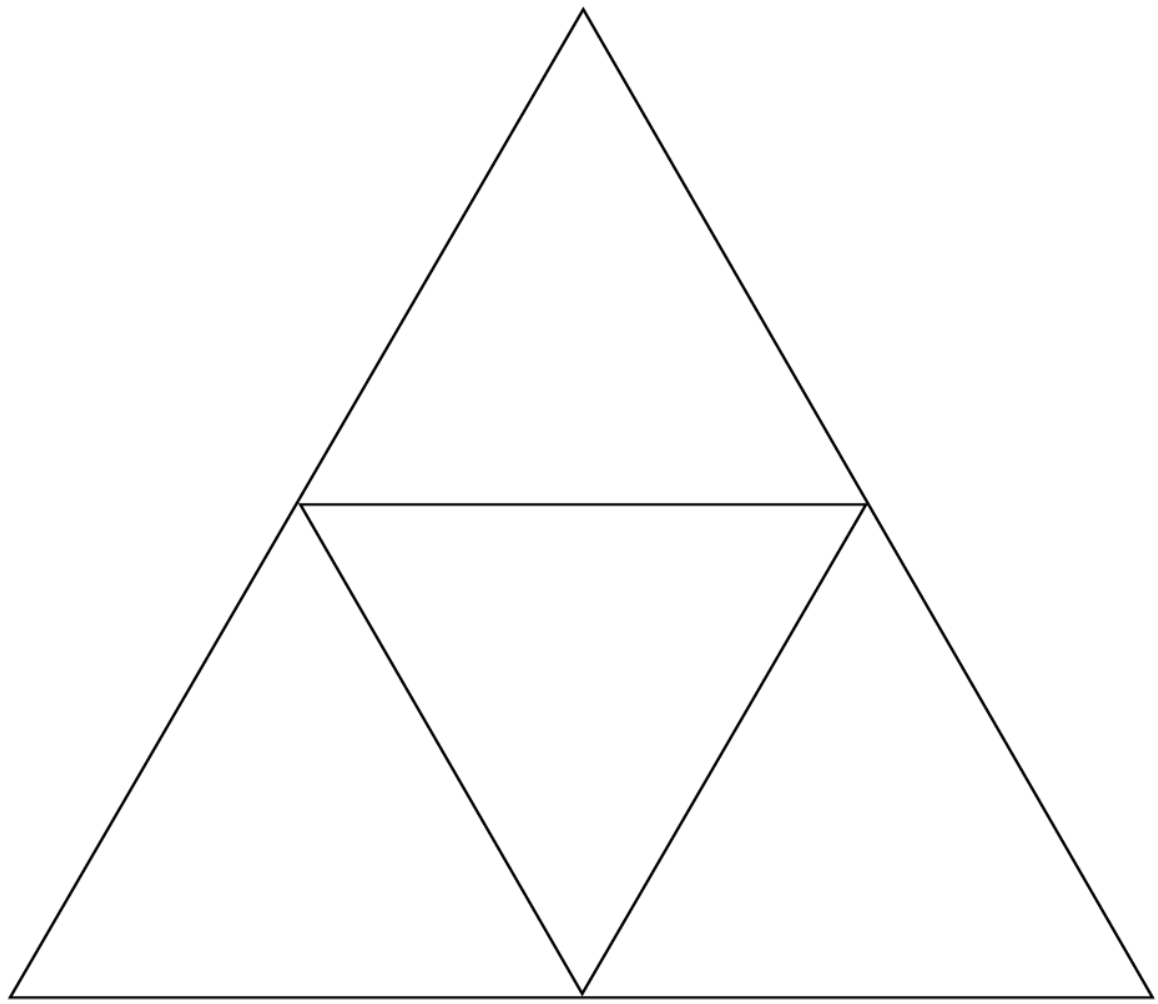


Figure 4.35

Activity 2:

To recognise and describe lines of symmetry in two-dimensional shapes including those in nature and its cultural art forms

[LO 3.4]

1. PROJECT.

- Collect as many different leaves as possible. See if they could be folded in half. If they can, the fold is called a LINE OF SYMMETRY. Of course, the two halves must be identical. Paste your leaves on a piece of cardboard, label the line of symmetry and decorate the classroom with them.
- Collect wild flowers and do the same with them.

2. Shapes.

2.1 Cut out the shapes below. See if each of them can be folded in half. The fold is called a LINE OF SYMMETRY. Use a ruler to make a dotted line on the fold. Some shapes have more than one line of symmetry. Remember that both halves must be identical. Draw in all the lines of symmetry and paste the shapes on top of the shapes on this page. Label your lines of symmetry.

2.2 Make other shapes, e.g. a circle, and fold them to find lines of symmetry. Paste them on the clean sheet as well. Label the lines of symmetry.

Figure 4.36

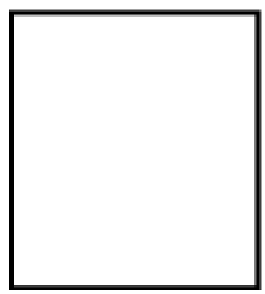


Figure 4.37

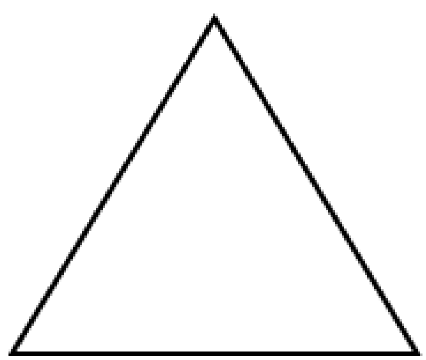


Figure 4.38

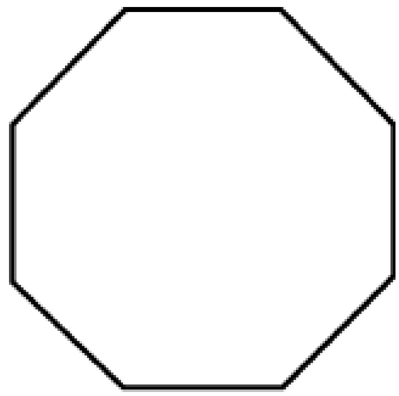


Figure 4.39

Activity 3:

To describe changes in the view of an object held in different positions

[LO 3.7]

If we see a large building from the front, we know that it will not look the same if we see it from the back or from the side or if we are standing in front of a corner of the building.

1.

1.1 Go outside and look at the school from the front.

1.2 Walk round to the back of the school and look at it again.

- Now walk to one side of it and look again.
- Finally, stand at a corner of the building and look at it again.

When seen from each of the above positions, the school looks amazingly different.

2. Make the objects below with sugar cubes and look at them from various angles.

3. Make some more objects with sugar cubes and examine them from the front, the back, the sides and the corners.

4. Draw the following objects as they would look if you saw them from:

4.1 behind:

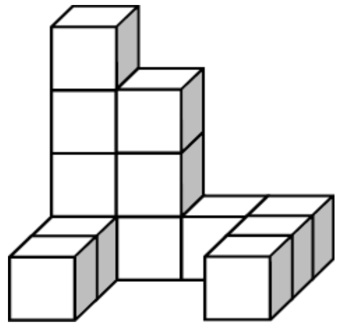


Figure 4.40

Front
4.2 from the left side:

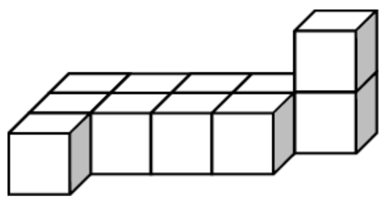


Figure 4.41

Front
4.3 from the right corner:

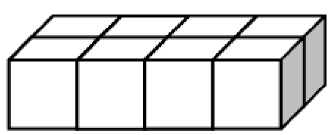


Figure 4.42

Front
Activity 4:
To investigate and approximate volume of three-dimensional objects [LO 4.8]

- You may work in groups. Each group will need: various small boxes, e.g. a matchbox; a rectangular container for margarine; a shoebox, etc. (try to have five of them); sugar cubes (or 1 cm wooden cubes from the Foundation Phase).

1. Pack sugar cubes into the matchbox and fill it with the cubes. How many do you need?

2. Now do the same with the other boxes and complete the table below:

Object (box)	Number of sugar cubes needed to fill the box
Matchbox	

Table 4.26

3. Measure the cube of sugar and record your findings:

- Length of cube:
- Width of cube:
- Height of cube:

4. The matchbox can contain …………… cubes; we say its volume is about ………... cubic centimetres.

5. When we measure what can go into the space in a container, we are measuring VOLUME and we need three measurements: length, width and height.

6. Instead of counting each little cube of sugar, what would be a quicker way of calculating the volume of a box? Discuss this with a friend and then write down your answer on the dotted line.

7. How many sugar cubes will you need to fill a box that is 20cm long, 15cm wide and 7cm high (a 2 litre ice-cream container)? Write down your calculations and then compare them with those of a friend.

4.3.6 Assessment

Learning outcomes(LOs)
LO 2
Patterns, Functions and AlgebraThe learner will be able to recognise, describe and represent patterns and relationships, as well as to solve problems using algebraic language and skills.
Assessment standards(ASs)
continued on next page

We know this when the learner:
2.1 investigates and extends numeric and geometric patterns looking for a relationship or rules, including patterns:
• represented in physical or diagrammatic form;
2.1.2 not limited to sequences involving constant difference or ratio.
2.2 describes observed relationships or rules in own words.
LO 3
Space and Shape (Geometry) The learner will be able to describe and represent characteristics and relationships between two-dimensional shapes and three-dimensional objects in a variety of orientations and positions.
We know this when the learner:
3.2 describes, sorts and compares two-dimensional shapes and three-dimensional objects from the environment according to geometrical properties including: • shapes of faces; • number of sides; • flat and curved surfaces, straight and curved sides.
3.3 investigates and compares (alone and/or as a member of a group or team) two-dimensional shapes and three dimensional objects studied in this grade according to the properties already studied, by:
3.3.1 making three-dimensional models using cut-out polygons (supplied);
• drawing shapes on grid paper;
3.4 recognises and describes lines of symmetry in two-dimensional shapes, including those in nature and its cultural art forms;
3.5 makes two-dimensional shapes, three-dimensional objects and patterns from geometric objects and shapes (e.g. tangrams) with a focus on tiling (tessellation) and line symmetry;
3.6 recognises and describes natural and cultural two-dimensional shapes, three-dimensional objects and patterns in terms of geometric properties;
3.7 describes changes in the view of an object held in different positions.
LO 4
continued on next page

measurementThe learner will be able to use appropriate measuring units, instruments and formulae in a variety of contexts.
We know this when the learner:
4.8 investigates and approximates (alone and /or as a member of a group or team):
4.8.2 area of polygons (using square grids and tiling) in order to develop an understanding of square units; • volume/capacity of three-dimensional objects (by packing or filling them) in order to develop an understanding of cubic units.

Table 4.27

4.3.7 Memorandum

ACTIVITY 1: 3D Objects

1. Investigation – practical
2. Using a net – practical
3. Practical – Tetrahedron (tetra – Greek = 4)

1. Using investigations

Object	Surfaces	Flat or curved	Corners	Edges
Rectangular prism	6	Flat	8	12
Cube	6	Flat	8	12
Tetrahedron	4	flat	5	7

Table 4.28

ACTIVITY 2: Symmetry

1. PROJECT – own – practical
2. Shapes

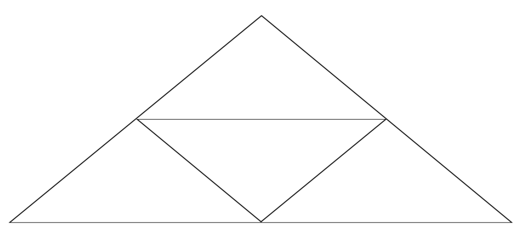


Figure 4.43

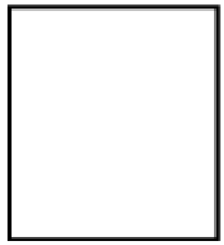


Figure 4.44

Figure 4.45

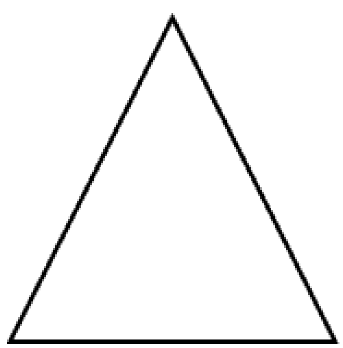


Figure 4.46

2.1 and 2.2 and 2.3 Cutting and folding and ruling lines of symmetry,

e.g.
(**Note:** in a rectangle diagonals cannot be used for just folding.)
ACTIVITY 3: objects seen from different angles
1.1 to 1.4 Practical – studying a building from various angles
2. and 3. Practical – working with cubes
4.1 to 4.3 Drawing – difficult!
ACTIVITY 4: volume
1. own
2. own investigation
3. 1 cm; 1 cm; 1 cm
4. own
5. -
6. Discussion (length x breadth x height)
7. 2 100 sugar cubes

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Pages: 176-185

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